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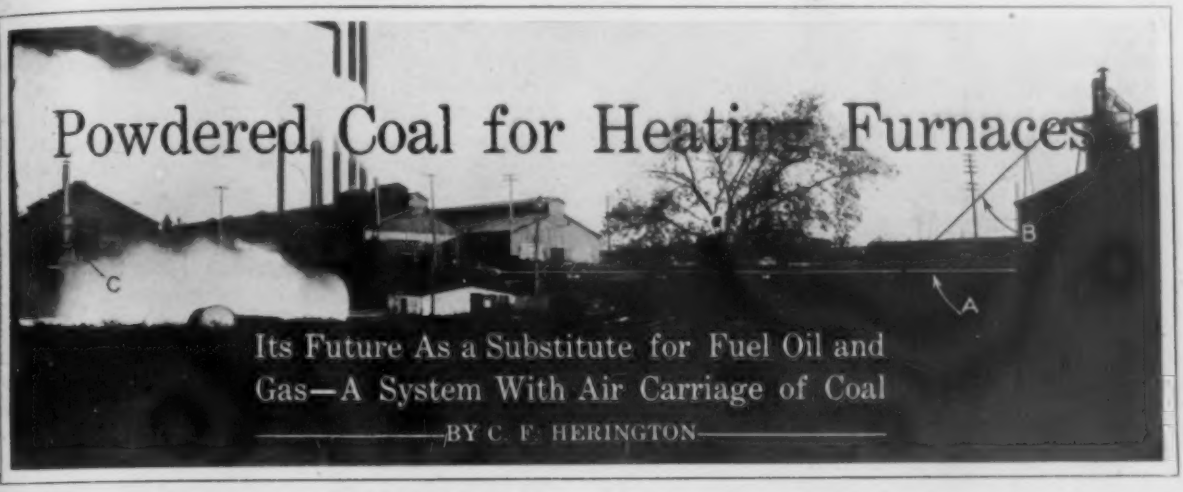
Powdered Coal for Heating Furnaces



Its Future As a Substitute for Fuel Oil and Gas—A System With Air Carriage of Coal

BY C. F. HERINGTON

The powdered coal as used in the Transue & Williams drop forging plant at Alliance, Ohio, is conveyed by means of a current of air moved by blowers. The pulverized coal leaves the pulverizing building of the works at the right in pipe A and is utilized in the forge shop at the extreme left. The supply delivered in excess of the demand is returned in another pipe line, which reaches the separator through the pipe B, so that it may again be taken by the blower and circulated through the system. At C is the separator for the ashes which are drawn from the various furnaces by means of an exhauster

IN industrial heating furnaces of all kinds powdered coal is going to prove the best fuel. If the furnaces are designed to utilize powdered coal to the best advantage, and the coal dust is economically conveyed to, and regulated at the furnace, leaving no residue of fine particles of dust on the work, and the smoke and ashes are carried away, a fuel is available which fulfils everything to be desired.

It was in 1905 that John R. Culliney, superintendent of the American Steel & Iron Mfg. Company, patented his controlling device. This controller has been in successful use at that plant ever since and it is being used for over 100 furnaces and all credit must be given to Mr. Culliney for his success.

If powdered coal is to prove a commercial success for industrial heating furnaces it will require:

1. That both the free and combined moisture be expelled by artificial heat, down to 0.5 per cent.

2. That it be pulverized so that 95 per cent. can pass through a sieve of 100 meshes to the inch and at least 80 per cent. pass through a 200-hundred mesh.

3. The delivery to the furnace must be absolutely controlled and regulated, so that the proper feed may be secured and mixed with the correct quantity of air for complete combustion.

4. That the coal after being pulverized shall be carried to the several furnaces in an economical and satisfactory manner.

5. That the coal shall have a volatile content of at least 28 per cent. and ash not more than 10 per cent.

Now the reasons why powdered coal is not more generally used for heating operations today are briefly as follows: Please note in my third requirement, "that the coal must be controlled and regulated." This is positively not done in any of the plants which I have visited (with two exceptions) and I have visited a number of them. Let me quote a report I made on one inspection of the conditions found, which are typical of all of them generally.

a—Powdered coal was uncontrollable, i.e. there was no apparent way to control a uniform supply of coal to the burner and have a uniform heat.

b—The coal dust persisted in caking in the bins, necessitating constant hammering on the sides by the operator. This of course left moments when there was no coal being fed into the furnaces and after a blow on the bins there was an over abundance of dust in the furnace.

c—It was dirty and smoky, as there was continually a large amount of unburned powdered coal coming out in smoke and sparks between the cracks in the doors, filling the eyes, nose and mouth and making things very uncomfortable.

d—It took more time to get up a working heat, due to conditions as stated in *a* and *b*.

e—Iron, for reasons that could not be explained by the operators, could not be welded.

f—At each furnace a large brick and steel stack was built to remove the smoke and ash, but was not proving successful.

My fourth requirement was that the coal after being pulverized "should be carried to the several furnaces in an economical and satisfactory manner." A 9-in. screw conveyor costs $4.50 per linear foot and costs for power at least $1 per day for every run of say 250 ft. If a screw conveyor clogs up and stops feeding, a lot of work is required to seek the point of stoppage and then to make repairs.

In regard to the caking in the bins, I have even seen the bins suspended by springs in order to elim-

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inate this caking due to the vibration of the hammers.

It was early last August that I heard of a mechanical engineer by the name of Austin A. Holbeck, of Cleveland, Ohio, who had made a success of burning pulverized coal by a new and novel method of distributing powdered coal by means of air instead of screw conveyors. A month later I had the pleasure of investigating an installation of this system, which is the subject of the accompanying illustrations.

The coal is dumped directly into a storage bin (this coal being slack, no crusher was required) and is fed by a 14-in. screw conveyor running at 2.2 r.p.m. into a closed elevator, which lifts the coal and spouts directly into a rotary direct dryer. From here the coal is elevated to a dried coal bin and carried across the pulverizing mill in which the screens have been removed. Connected to the top of this mill is a specially designed separator, the top of which is connected to an exhauster, which exhausts the fine coal dust and discharges it through a separator into a pulverized coal bin, the separator being connected back to the other separator at the mill.

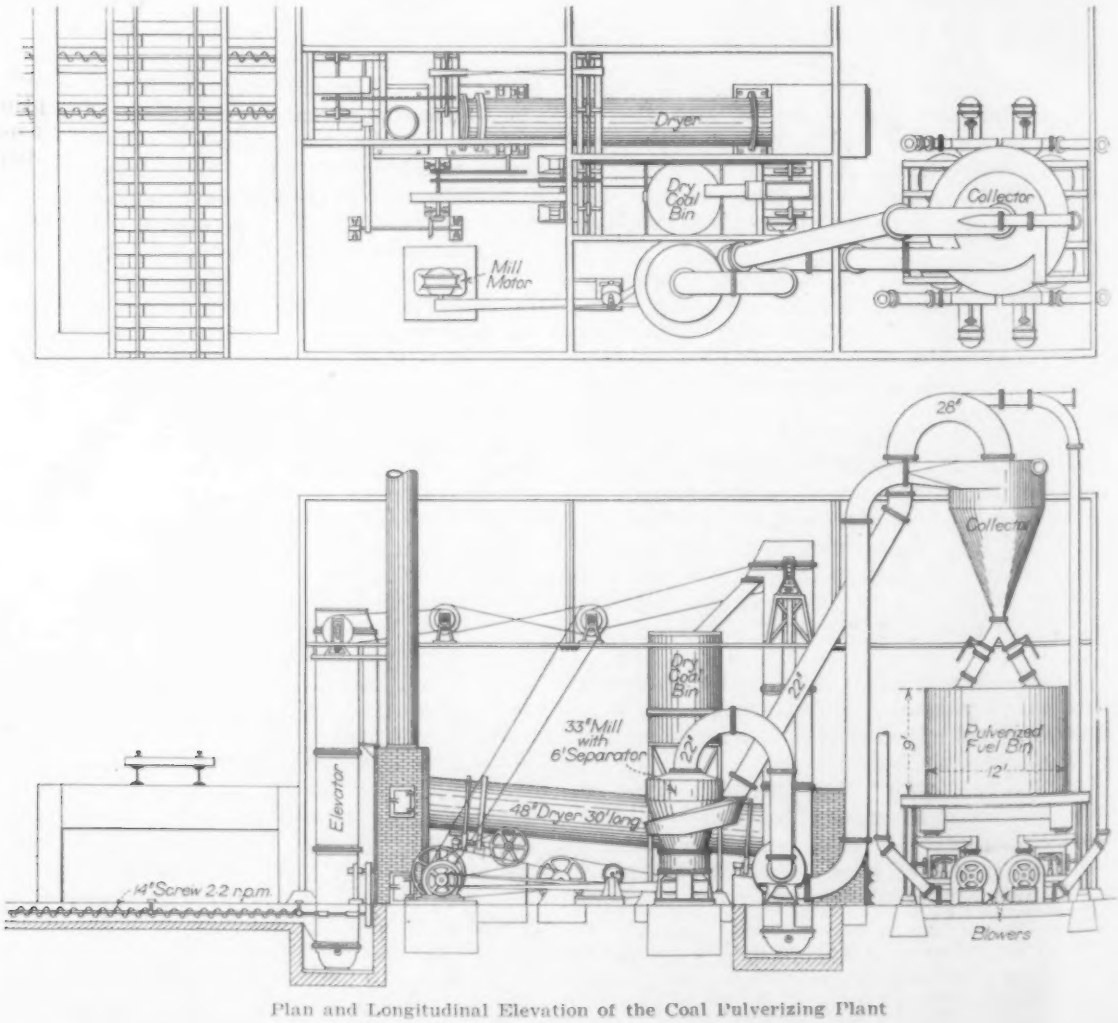
From the pulverized coal bin the coal is hoppered into a small screw conveyor into the suction end of a high-pressure blower, passing through a patented automatic governor shown in the illustrations, which regulates the amount of coal with the required amount of air necessary to move it. From the blower the coal mixed with air is discharged through a pipe with a velocity of several thousand feet per minute, which runs around the forge shop overhead and at each furnace two branches are taken off each with a valve and dropped to a burner at each end of the furnace. There the burner receives the secondary air for combustion and the mixture is blown directly into the furnace.

At points in the circulating main, if the line is a long one, or if not, at the end of the supply line a booster blower is placed which takes the coal and air mixture and discharges it through a return line back to the pulverizing plant, where it is again circulated around the furnaces to be used. The valves at each branch are controlled from the floor by the operator.

No large combustion chamber is built nor is the furnace changed to any extent, simply the oil or gas supply is cut off and the powdered coal is inserted in its place. There are no coal bins at the furnaces. A line of spiral riveted pipe overhead brings the coal and to shut down a furnace the valves in each of the two branches are closed and the automatic governor at the pulverizing plant does the rest. The governor works to regulate the amount of coal and air needed for the circulating main to supply the furnaces being operated.

For getting rid of the ash and smoke, the front walls of the furnace are built out and a sheet steel hood is placed directly across the front of each furnace, the bottom of hood just above the work opening. Each hood is tapered into a small pipe and connected to an exhaust main. At one end of the shop an exhauster is placed and to this the exhaust main is connected and the contents are discharged into a separator placed outside the building. Underneath the separator is a bin, from which the ash can be collected and removed when necessary.

And now the question arises, how much does powdered coal cost and how much will one save by using it? Let us take a plant now using fuel oil



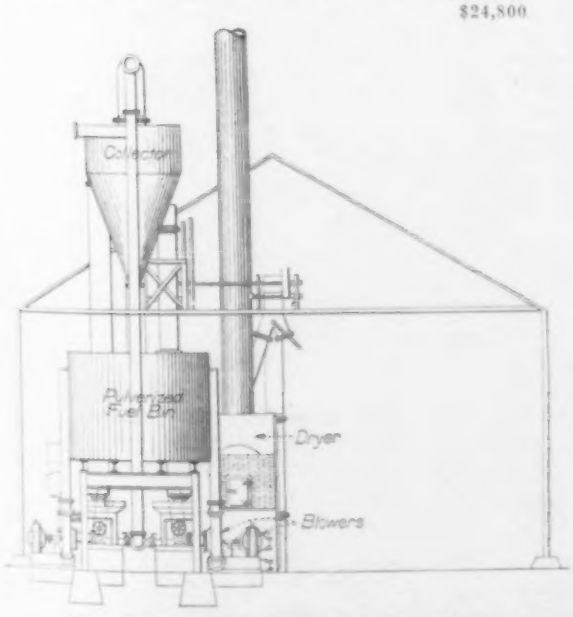
Plan and Longitudinal Elevation of the Coal Pulverizing Plant

Coal brought to the pulverizing building is elevated at A and from the hopper drops through the chute B to the dryer. From the rear end of the dryer the coal is elevated and delivered into the dried coal bin C, below which is the pulverizer. Air separation of the coal dust is employed and the pulverizer is connected with the blower E by means of the pipe D, and the blower discharges through pipe F to the separator above the building roof. At G may be seen the delivery chute of the powdered fuel to the bins shown, and at H is the cortroller regulating the delivery of powdered coal from the bins

in 40 furnaces and consuming 60,000 gal. of oil per month at 4.75 cents a gallon.

The Cost of the Fuel Oil Plant

Three 10,000-gal. storage tanks at $800.....	$2,400
Unloading, excavation and setting tanks....	900
Two auxiliary pressure tanks in place.....	1,950
One circulating pump and motor.....	150
Piping, fittings and valves.....	5,000
Steam and air connections to tank.....	1,500
Connections to furnaces, 40 at $50.....	2,000
Standpipes for tank cars.....	150
Pump and pump house.....	500
Blowers, motor and blast connections.....	5,000
	$19,550
Contractor's profit, 15 per cent.....	3,000
	$22,550
Engineering and contingencies, 10 per cent..	2,250
	$24,800



Cross-Section of the Coal Pulverizing Plant

Say $25,000 as the first cost of a fuel oil plant.

Now if we are using 60,000 gal. of fuel oil per month and the oil averages 140,000 B.t.u. per gallon, we have with coal of 14,000 B.t.u. calorific value an equivalent of $10 \times 60{,}000 = 600{,}000$ lb. of coal, or 300 tons of coal per month for the pulverized coal plant.

For the gas plant, for the same requirement we may consider a water gas plant, using the water gas for the high-temperature furnaces and producer gas for the low-temperature furnaces. As 1 lb. of coal will give about 20 cu. ft. of water gas and 50 cu. ft. of producer gas, or about 80 per cent. efficiency, we will estimate that we need about 70,000 cu. ft. of water gas per hour, so that $70{,}000 \div 20 = 3500$ lb. of coal would be required per hour or $3500 \times 10 \times 25 \div 2000 = 480$ tons of coal required per month.

So if we substitute a water gas plant for our fuel oil plant it will cost:

Cost of Water Gas Plant

Gas plant machinery erected in place.....	$45,000
Building, complete with foundations.....	20,000
Coal trestle, hoppers and siding.....	6,500
Gas piping, meters, valves, water piping....	12,500
Changes in furnaces.....	3,000
	$87,000
Contractor's profit, 15 per cent.....	13,000
	$100,000
Engineering and contingencies, 10 per cent..	10,000
	$110,000

Say $110,000 for the first cost of a gas plant.

For the cost of a pulverized coal plant, let us figure what the plant would cost by the old method of using bins, screw conveyors, etc.

Cost of Pulverized Coal Plant with Screw Conveyors

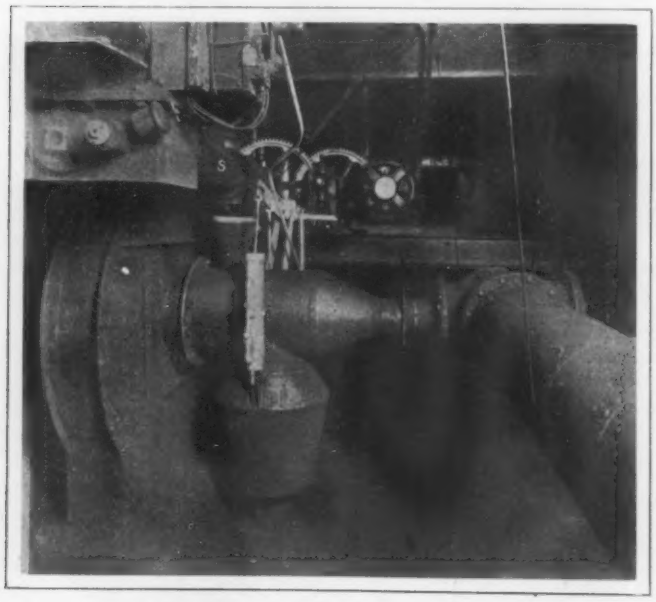
Pulverizing machinery	$12,000
Building and foundations.....	6,000
Machinery foundations	2,000
Coal trestle and track siding.....	6,500
Conveyor system to furnaces.....	11,500
Walkways and conveyor supports.....	6,000

At A may be seen the powdered coal main from which branches 2½ in. in diameter, marked B, drop to reach the different furnaces, two branches serving each furnace. At C is the supplementary air pipe line and at D may be seen the oil fuel supply service, which may be put into use with minimum delay if the pulverized coal service should go out of commission. E is the branch exhaust pipe for carrying off the ashes from the hood in front of each furnace and F is the main ashes exhaust line. A pendant chain, G, serves to control the valves in the branch coal pipes to the furnaces

Forward from p. 1047	$44,000
Motors and wiring for conveyors	8,000
Burners and controllers for 40 furnaces, at $250	10,000
Furnace changes, stacks	4,000
Furnace bins, 40 at $100	4,000
Hoods and exhaust system complete	6,000
Stack thimbles through roof	1,000
	$77,000
Contractor's profit, 15 per cent.	11,650
	$88,650
Engineering and contingencies, 10 per cent.	8,850
	$97,500

Say $98,000 for first cost of powdered coal plant by the old method.

By the new method the cost would be as follows:



On the suction side of the blower may be seen the governor, which is designed to control the delivery of coal, in accordance with the pressure conditions of the pipe lines, the pressure varying as the number of outlets at the furnaces is varied. By means of levers it controls the rheostat at the top of the view, which controls the speed of the motor driving a screw at S, which in turn delivers from the hopper to the inlet of the blower variable amounts of powdered fuel

Cost of Pulverized Coal Plant with Air Carriage

Pulverizing machinery	$12,000
Buildings and foundations	6,000
Machinery foundations	2,000
Coal trestle and track siding	6,500
Spiral riveted piping and valves	8,500
Furnace changes	2,500
Blowers, motors and wiring	10,000
Hoods and exhaust system complete	6,000
	$53,500
Contractor's profit, 15 per cent.	8,025
	$61,525
Engineering and contingencies, 10 per cent.	6,175
	$67,700

Say $68,000 as first cost of a pulverized coal plant by the new method.

Now our operating cost per year includes our fixed charges and operation, and is estimated as follows:

Operation Cost of Fuel Oil Plant

Fixed charges:	
Interest, 5 per cent. of $25,000	$1,250
Depreciation, 10 per cent.	2,500
Taxes and insurance, at 1 per cent.	250
	$4,000
Operation:	
Oil, 60,000 x 12 x 4.75c.	$34,200
Labor, 2 men.	2,000
Electrical current, air and steam	800
Repairs, 2 per cent. of $25,000	500
	$37,500
Total for year	$41,500

Operating Cost of Water Gas Plant

Fixed charges:	
Interest, 5 per cent. of $110,000	$5,500
Depreciation, 10 per cent.	11,000
Taxes and insurance, 1 per cent.	1,100
	$17,600
Operation:	
Coal, 480 x $2.50 x 12	$14,400
Labor, 1 operator and 2 assistants	2,800
Unloading coal, at $1.50 a car	200
Cleaning generators	200
Water	200
Steam	200
Repairs, 2 per cent. at $110,000	2,200
	$20,200
Total for year	$37,800

Operating Cost of Pulverized Coal Plant with Screw Conveyors

Fixed charges:	
Interest, 5 per cent. of $98,000	$4,900
Depreciation, 10 per cent.	9,800
Taxes and insurance, 1 per cent.	980
	$15,680
Operation:	
Coal, 300 x $2.50 x 12	$9,000
Labor, 1 operator and 2 assistants	2,800
Unloading coal, at $1.50 a car	100
Electrical current for motors	3,000
Repairs, 2 per cent. of $98,000	1,960
	$16,860
Total for year	$32,540

Operating Cost of Pulverized Coal Plant with Air Carriage

Fixed charges:	
Interest, 5 per cent. of $68,000	$3,400
Depreciation, 10 per cent.	6,800
Taxes and insurance, 1 per cent.	680
	$10,880
Operation:	
Coal, 300 x $2.50 x 12	$9,000
Labor, 1 man and 2 assistants	2,800
Unloading coal, at $1.50 a car	100
Electrical current for motors	1,500
Repairs, 2 per centt. of $68,000	1,360
	$14,760
Total for year	$25,640

We save on fuel oil in our total yearly cost: $41,500 — $25,640 = $15,860, or $16,000, which will pay off our investment in five years. The figures indicate that pulverized coal used in the air carriage plant is equal to fuel oil at 2½ cents a gallon, including all charges. An accompanying chart shows the comparisons.

The Cleveland office of the Allis-Chalmers Mfg. Company has taken an order from the city of Cleveland for three triple expansion pump engines, two with a capacity of 25,000,000 gal. each and one with a capacity of 20,000,000 gal. in 24 hours.

The New Stamp Taxes

Adhesive stamp taxes, which affect the public directly to a greater extent than any of the others levied by the act, which goes into effect December 1, comprise the following:

Bonds, debentures, certificates of indebtedness by any association, company or corporation, new issues, $100 par value, each	$0.05
Sales or agreements to sell stocks, $100 par value, each	.02
Agreement of sale of products or merchandise on exchanges, each $100	.01
Promissory notes, except bank notes for circulation and renewal, each $100	.02
Telegraph and telephone messages over 15 cents, paid by senders	.01
Bundles or packages sent by freight or express, each.	.01
Certificates of profits of corporations, etc., and transfers thereof, face value each $100	.02
Damage certificates, etc.	.25
Other certificates not otherwise specified	.10
Broker's note or memorandum of sale	.10
Deeds or realty transfers valued between $100 and $500	.50
Deeds or realty transfers for each $500 or fraction exceeding $500 in value	.50
Custom house entries of goods, $100 value	.25
Custom house entries of goods $100 to $500 value	.50
Custom house entries of goods exceeding $500 value	1.00
Custom house entries for withdrawal of goods	.50
Insurance of property, new or renewed policies, each $1	.00½
Insurance policies or bonds of nature of indemnity for loss, etc., each $1	.00½
Steamship passage tickets to foreign ports, up to $30	1.00
Steamship passage tickets costing from $30 to $60	3.00
Steamship passage tickets costing over $60	5.00
(Passage tickets costing $10 or less exempt)	
Perfumery, cosmetics, etc., vaseline, hair dyes, tooth washes, graded in value from 5c. to 15c., for each 5c.	.00⅛
Ditto, values from 15c. to 25c.	.00⅝
Ditto for each additional 25c. value	.00⅝
Chewing gum, etc., each $1 retail value	.04
Voting powers or proxies	.10
Power of attorney to convey real estate, etc.	.25
Protest of notes, etc., each	.25
Palace or parlor car seat and sleeping berth, to be paid by company, each	.01

The taxes provided under the act will not be levied after December 31, 1915, though all those accruing up to that date will continue to be collectible.

Successful Bidders for Armor and Shells

Secretary Daniels, of the Navy Department, announced October 27 that the contracts for armor plate for the three new battleships of the California class were to be divided between the Midvale Steel Company and the Bethlehem Steel Company. "When the bids were opened, on October 7," Secretary Daniels said, "it was found that the Midvale Steel Company, bidding on quantities for one ship, was lowest in its price on classes A-1 and C, and that the Bethlehem Steel Company, bidding on quantities for two ships, was lowest on class A-2. On class B armor the Midvale and Bethlehem bids were the same. Negotiations were immediately begun with the bidders, as the result of which the department is to obtain all armor at the lowest bid submitted for each respective class. He announced that the contracts will be awarded as follows:

To the Midvale Steel Company:

Class	Tons.	Price.	Total.
A-1	7,374	$435	$3,207,690
A-2	401	486	194,886
B	290	466	135,140
C (steel)	63	376	23,688
Total			$3,561,404

To the Bethlehem Steel Company:

Class	Tons.	Price.	Total.
A-1	14,748	$435	$6,414,380
A-2	802	486	389,772
B	580	466	270,280
C (steel)	126	376	47,376
Total			$7,121,808

On October 30 Secretary Daniels announced the result of the opening of bids for common shells of 4 and 5-in. caliber for use on the ships of the service, and for 14-in. armor-piercing shells for the latest type of dreadnought. The E. W. Bliss Company was the lowest bidder for the 4-in. shells with an offer of $9.50 a shell, while the Bethlehem Company's bid was $9.80, the Tredegar Steel Company $9.95, the Washington Steel & Ordnance Company $10, and the American & British Company $10. The E. W. Bliss Company and the American & British Company were the lowest bidders for the 5-in. shell, its offer being $12 a shell, compared with $13.75 as the bid of the Washington Steel & Ordnance Company. The Bethlehem Steel Company was the lowest bidder for the manufacture of 14-in. shells. Its bid was $415 a shell, compared with $425 by the Crucible Steel Company, and $426 by the Washington Steel & Ordnance Company.

The pipes B are the delivery pipes of powdered coal; pipe C is the supplementary air supply; D is one of the oil supply pipes, ready for use at any time; E is the exhaust line for the ashes, and G shows one of the chains for operating the supply coal valve. The hood shown is of double construction, an inner member not visible, providing for a removal of the products of combustion with the ashes in spaces between the two hoods

The Schaefer Mfg. Company, an important special machinery builder, Berlin, Wis., is enjoying an excellent run of foreign business on its milk condensing equipment. Last week shipments were made to Great Britain and Holland and considerable equipment is still in process of manufacture on European order.

Chart Comparing Cost of Oil, Gas and Powdered Coal as an Industrial Fuel

Trade Supremacy Large Factor in the War

President Gary Finds the Same Spirit in the European Struggle That Has Led to Destruction and Oppression in Business

The address of President E. H. Gary at the Birmingham meeting of the American Iron and Steel Institute last week received marked appreciation from his hearers. With the war as a text the address brought home the evils of destructive competition in trade and contrasted the spirit of the European powers with that of the steel masters of the various nations now involved in war, who met at Brussels three years ago.

A sentiment that evoked warm applause was Judge Gary's declaration that "if the large numbers of business men who were represented upon this memorable occasion [at Brussels] from all of the countries engaged in the iron and steel industry could have had opportunity to consider and determine the questions leading up to the war which is raging in Europe, there would have been no war."

Interpolating in that part of his address referring to the co-operative or Gary dinner movement of 1907-11, Judge Gary said, referring to the Federal Trade Commission: "It is a remarkable fact that the spirit which prompted you gentlemen seven years ago to bring about a competition that is fair has now been put by Congress into legal language and a commission has been appointed to see that the law is enforced."

Substantially in full the address follows:

We may felicitate ourselves on the privilege of holding our convention within the confines of the beautiful city of Birmingham. The splendid achievements of the city during its 40 years of growth excite our admiration; and the hospitable sentiment of her people which pervades the atmosphere enlists our gratitude. Highly appreciative of the traditional warmth and friendship of the people of the Sunny South for the stranger who enters within her gates, we are especially pleased to be the invited guests of this great city and to witness what has been and is being done to establish it as a great industrial metropolis.

Everything I could say to you concerning the American Iron and Steel Institute and the work it is doing would be favorable. . . . Moreover, the feeling of business friendship between the members of the institute from the time of its organization has not decreased, but is growing stronger and more deeply rooted as the years pass by. We are all proud to be considered honorable and worthy members. The institute has before it a great future for service and results. Let us make it even better and more useful. It will be a power for good in the industrial world. The magnitude of the iron and steel industry in the years to come is probably beyond even the imagination. It is not too much to expect that this institute will be one of the potential factors in the further development and utilization of the economic forces of this country which entitle her to be considered as a nation of commanding position and influence.

PRESENT BUSINESS CONDITIONS NOT PROSPEROUS

We are accustomed on occasions of this kind to refer to conditions of business. I am an optimist in principle as well as in practice. There is always a bright side, although it may be temporarily obscured. However, nothing is to be gained by closing our eyes to well-known and clearly recognized facts; and at present we are not very prosperous in our lines. This is reflected in the published reports of some of the larger companies. The president of one declares that "earnings from January 1 to October 1, 1914, on the tonnage produced have been at the smallest margin of profit since the formation of the company." The report of another company shows that the income from manufacturing and operating, after deducting all incidental expenses, is less than one-seventh as much for the first nine months of 1914 as it was for the same period of 1913. Still another sets forth that, for the first six months of 1914 the net earnings from operations were less than one-half of the amount realized for the same period of 1913. For the company last referred to I have no report since June 30, 1914.

I do not refer to the results of the Steel Corporation nor to those of any other company because those of the former are extensively advertised from time to time, and are well known; and the reports of the others are not published at all, so far as I have been able to ascertain. It is sufficient to say at this time that the volume and prices of iron and steel sold in this country were very low, comparatively speaking, during the months immediately prior to the commencement of the European war; and with respect to the volume, there have been substantial decreases since that time. These facts are well known to all of you, and I would be doing an injustice if I were to assume that any of you was unfamiliar with them.

WEALTH OF THIS COUNTRY INSPIRES CONFIDENCE

But what of the future? What is there to encourage and stimulate us in our struggle for present existence and future success? It is well at all times to remember fundamental facts. At the semi-annual meeting of the institute of October, 1913, there were given some figures in relation to the comparative wealth of the leading nations of the world. While they ought to be modified to some extent on account of the figures which have subsequently been published, still it is true that the enormous wealth of the United States is increasing and largely exceeds the wealth of any other country. And as an additional and important item it may be observed that of the eight and a half billion dollars of gold held throughout the world the United States is possessed of considerably more than one-fifth, if we may rely upon published statistics.

But, of more consequence even, we are always comforted by the fact that the productive capacity and the actual production of wealth in the United States are growing year by year; and this ability to produce will not and cannot be diminished. Actual realization of profits may be interrupted, but the great variety of its products and the length and breadth of its domains, with a climate and atmosphere unsurpassed, continuously serve to insure a certainty of increasing wealth and prosperity, and enable us to rely upon the ability of the nation to comfortably support her own inhabitants and to furnish a surplus to other nations in large and increasing quantities with corresponding returns in value. You are acquainted with the figures and realize the extent of our riches and the magnitude of our production.

They are not referred to in a boastful spirit nor for any reason except one of encouragement for the future.

NEXT THREE MONTHS TO BE BETTER THAN THE PAST THREE

Besides, at the present time the exports of a large variety of commodities are increasing, and although not equal to the volume reported just prior to the commencement of the war, yet much larger than immediately following the beginning of the war. This will have a material influence upon other lines. All are stimulated and brought into service. Without particularizing, it would seem safe to predict that in many important respects business conditions in the United States for the next three months at least will be better than they have been for the last three months.

As to the long future I do not hesitate to say, with emphasis, that the opportunities for progress and success in this country are greater than ever before. If we can get out of the ruts of antagonisms, inconsistency, distrust, hypocrisy, individual indifference to the rights and interests of others, which seem to have prevented natural and legitimate progress during the last few years, so that the people generally will disregard undue personal ambition and will work together, joining hands for the protection and promotion of the welfare of all alike, having a disposition to utilize to the best advantage the privileges which this country affords, it will be only a question of time, and short at that, when the United States will be firmly established as the leading country of the world.

FAITH IN THE FUTURE

Times and conditions are auspicious. The United States, with its vast wealth and resources, should be the financial, industrial and commercial center of the world; and to a corresponding degree will be opportunities for worthy achievement in every direction. To the extent that we prosper legitimately and without prejudice to the rights or interests of others we may be able to render assistance to others who may need and are willing to accept it.

It is wise for all of us who are here today to place our faith in the wonderful possibilities of this country. In this connection, it is to be remembered there is a growing sentiment throughout the country in favor of just and fair treatment to all the people and all departments of human endeavor. There is a decided change for the better in this respect. Much has been said during the last few years in favor of according full attention to the rights of individuals, particularly those less fortunate in the contest to acquire the comforts of life; and this is right and must not be minimized nor interfered with; but in discussing these questions writers and speakers have sometimes been unreasonable in placing the blame for objectionable conditions. However, it now seems clear that in the future greater regard will be had for the rights and interests of all classes of the people without discrimination. Equal justice will be done to all, rich or poor, strong or weak. Politics or partisanship will not be used to obstruct the normal and legitimate growth of the country; and one of the most gratifying and encouraging signs of the times is the attitude of the leaders in public discussion and of the administrators of public affairs.

THE EUROPEAN CONFERENCE IN 1911

About three years since a few of us had the privilege of meeting in Great Britain and Continental Europe the leading representatives of the iron and steel manufacturing interests of the world. For several days we were in close association with those men and became well acquainted with them and the spirit and motives which dominated their attitude and treatment of one another.

The countries represented included England, Scotland, Wales, Belgium, France, Germany, Austria, Italy, Russia, Spain, Hungary, Canada and the United States. All were pecuniarily interested in the iron and steel industry. All were active competitors, individual concerns of a single country with each other and each country with all other countries. While those engaged in many respective lines of manufacture were protected to a considerable extent against ruthless and destructive antagonisms by virtue of cartels or arrangements, recognized, if not fostered, by the chief authorities of their respective countries, yet there existed rivalry and competition which might, and at times no doubt did, produce feelings of envy and dissatisfaction. Nevertheless, it was evident that a feeling of business friendship permeated the minds and influenced the conduct of these men, and this in the main tended to establish and uphold an orderly and profitable management of the affairs entrusted to them. And the disposition shown toward and the hospitality extended to the Americans by all others on this occasion secured for them our everlasting gratitude and esteem.

Those of us who were enabled to participate will never forget the incidents connected with our visit in England, Belgium and other places, or the disposition shown by every one to evidence his respect for and confidence in his rivals in business. In passing, I will add that if the large numbers of business men who represented on this memorable occasion all of the countries engaged in the iron and steel industry could have had opportunity to consider and determine the questions leading up to the war which is raging in Europe there would have been no war. These intelligent, experienced, practical, sensible and Christian men, being from time to time in close contact, and therefore well acquainted with each other, would have been patient, considerate and fair-minded and would have made adjustments and reached conclusions calculated to protect the interests of all and to prevent the possibility of the present deplorable hostility.

THE WAR IN EUROPE

And because the subject attracts our attention and occupies our minds almost to the exclusion, for a portion of the time at least, of all other topics; and also for the purpose of making application to our own affairs, I ask your indulgence while I briefly refer to the cataclysm which envelopes a large portion of Europe and involves the lives and interests of hundreds of millions of people. We cannot think of this conflict without feelings of horror. It is impossible to realize the extent of the suffering and misery which it entails. If it should continue for 18 months from the time of the commencement, the loss of life by reason of injuries received on the battlefields and sickness directly resulting from participation in the war will aggregate four millions in number; and the direct and indirect pecuniary loss to all the nations concerned will amount to thirty-five billion dollars. Indeed we will never be informed of the actual loss in lives or money which will result from this war.

Without attempting to locate the blame for the war, because the people of this country are disposed to maintain a position of strict neutrality, we may perhaps consider, though we would hesitate to do more than suggest the possible cause or causes. We hear from those who advocate the settlement of international disputes by resort to force many different reasons, some giving one

Judge Gary on the Future

It would seem safe to predict that in many important respects business conditions in the United States for the next three months at least will be better than they have been for the last three months. As to the long future, I do not hesitate to say, with emphasis, that the opportunity for progress and success in this country is greater than ever before. If we can get out of the ruts of antagonism, distrust, hypocrisy, individual indifference to the rights and interests of others, which seem to have prevented natural and legitimate progress during the past few years . . . it will be only a question of time, and short at that, when the United States will be firmly established as the leading country of the world.

reason and some another, which is believed in and insisted upon as sufficient. . . . Without giving reasons in detail at the present time, I venture the opinion that the struggle for commercial supremacy was the underlying cause of the war, or at least had a decided influence upon its precipitation; that the questions at issue largely relate to dollars and cents. And many believe if representatives of the different nations had previously met in a spirit of friendly and considerate inquiry for the purpose of definitely and finally settling the financial interests of each, all trouble could have been averted.

If this be true, and I will assume it for the purpose of making a point later on, it may be inquired what will be the final result of the conflict? The nation that wins will surely lose, although this would seem at first blush a paradox. The enormous cost before mentioned and the long continued suffering on the part of the survivors will not be fully covered by any success or glory or indemnity. . . . Personally, I believe in a positive and binding agreement between all the nations for the final settlement by arbitration of all international disputes on a basis to be decided by a competent and impartial tribunal and for the enforcement of decisions by the nations not personally involved in the question at issue. Such an agreement could be made, such a tribunal could be permanently established and such an enforcement made practical if the nations were so disposed. . . . I hope the time will come, even though not in my time, when wars and rumors of wars shall cease.

LESSONS OF WAR APPLIED TO BUSINESS

All that I have said applies forcibly to our business. We who are here today are engaged in competition; we are naturally selfish; we are often inconsiderate and indifferent. In representing the interests of those who place us in official position we feel obligated to strive for success, and we go beyond reason or justice. As many of you have remarked at previous meetings, it was customary in the days gone by to harbor the same feelings and to pursue the same line of conduct in the iron and steel trade that have been exhibited in the European conflict. Business men struggled for revenge, or conquest, or suppression, or other reasons just as bad. The graves of concerns destroyed were numerous; this has lately been testified to in open court by those who were familiar with the subject. As bearing upon these conditions, I quote from an address made on a certain notable and well-remembered occasion by one of your number:

> The old basic principle was based on a distrust of one's competitors; on the feeling that, to succeed yourself, you must crush your rivals; and on the solid belief that they were mean enough to feel the same toward you. As a result, every man went out knifing for his competitors; an industrial panic ran like wildfire. The smaller concern went down to ruin, and the stronger, which worried through to harbor, required financial experts to heal or to hide his wounds. No one benefited by this—all suffered, manufacturer and consumer alike.

Today I congratulate you on your success in bringing about a new order of things in business. You have become well acquainted; you have confidence in each other; you believe what is told you; you recognize the interests of your neighbor; you are glad when he prospers and equally sorry when he fails of success. You have a better and clearer understanding of business obligations. You can faithfully represent your stockholders, or the owners of your properties and indulge in the keenest competition, without doing anything that is destructive and oppressive, or unfair.

This institute at the outset adopted, by tacit consent at least, as one of its principles the following sentiment:

> Real, hearty, cheerful and continued co-operation on the part of the members will secure results which should be entirely satisfactory. Frank and friendly intercourse; full disclosure of his business by each to the other; recognition by all of the rights of each; a disposition to assist and benefit each other so far as practicable and proper; conduct founded on the belief that healthy competition is wiser and better than destructive competition.

And so I trust that in all our deliberations we bear these principles in mind. Commercial warfare, which means destruction and oppression, should be as distasteful as the battles which kill and maim the soldiers, for they are the same in pecuniary results.

One of the fundamental principles of this institute is comprehended by the words "conciliation" and "co-operation." This should never be abandoned or modified. It should be extended to every branch of our activities. Nothing is to be gained and much is to be lost by antagonisms. Communities succeed or fail together. Competitors in trade, producer and consumer, employer and employee, the private individual and the public—all secure the best results if they work together. The success of one on legitimate lines means the benefit of all, and the failure of one means loss to all.

The more we consider these questions, the more clearly we realize that what I have said is true. But the unreasonable critic or agitator is the enemy of mankind, including himself. He obstructs and destroys and he does not create or improve. One who is controlled by selfish, unfair or dishonest motives—even though he may secure a temporary advantage—will never receive any lasting benefit. This applies to all classes of people and to every department of life. It applies to us in considering our attitude and conduct toward others, and, with equal force, to those whose action or disposition affects us. If we are sincere and fair in our treatment of others we may hope for similar treatment by them. If we are diligent in trying to ascertain the good in others they may see some good in us. The members of this institute will do their full share in the general endeavor to add to the material and moral strength and growth of the nation.

The Automobile Industry

In a recent address reviewing the development in the manufacture of motor cars, William Livingstone, president Dime Savings Bank, Detroit, Mich., brought out the following points:

"Probably 75 per cent. of all automobiles made in this country are produced in Detroit and Michigan. * * * It is worthy of note that at no time in 12 years has the industry as a whole taken a backward step, the record showing that each year an increasing number of cars has been made and sold, from less than 1000 cars in 1902, when the business may be said to have really begun, to 435,000 cars in the fiscal year ended June 30, 1914, the latter having a total valuation of about $425,000,000. Coupled with these figures are the products of the parts and accessory makers, with sales in the past 12 months running into big figures.

"There are more than 450 listed manufacturers of motor vehicles, some making both pleasure and commercial cars. Of these 170 make gasoline passenger cars, 245 gasoline commercial cars, 77 cycle cars, 27 motor fire apparatus, 18 electric pleasure cars and 24 electric commercial vehicles.

"Of dealers and garages we find listed 15,500 automobile dealers, 13,630 garages, 1280 repair shops and 680 supply houses.

"In exports we find an increase from $5,502,000 in 1907 to $34,500,000 in the 12 months ended June 30, while the imports during that period have decreased from $4,842,000 to $1,432,000."

The Canadian wire mills are experiencing unusual activity in their barb wire departments. Most of the plants with the necessary equipment are working to capacity in this line, and managers wish their capacity were larger. Orders for the allied armies running into thousands of tons have had to be refused owing to the impossibility of making delivery.

The Pennsylvania Engineers' Commission, which has been considering the propositions involved in a State system of licensing engineers, may ask the next Legislature for an extension of time. The problem is of such character that more time will be required to work it out.

Repair Department of Modern Steel Plant*

Continuity of Processes Must Be Maintained—Repair Departments Must Seek to Eliminate Delays

BY JOHN HULST†

The steel plant has no parallel both in the continuity of its processes and in the very large units of which it is composed, and which have been made necessary from the standpoint of economy in operation. From the reduction of the ore in the blast furnaces through the processes of steel making and rolling, the one process is closely linked with the next, so that practically it is continuous.

The steel plant of today, with its blast furnaces, each having a capacity of 500 tons or more, with its steel producing units still increasing in size, and with its rolling mills of very large capacites—and these units all dependent upon one another—presents difficulties seldom encountered elsewhere. The vast amount of capital invested as a total, as well as in each of the large separable units, makes it of prime importance that all operations, from the ore to the finished steel, be interrupted to the least possible extent.

The success of a steel plant of modern design is, therefore, largely dependent upon the extent to which delays are eliminated, and this constitutes the daily study of the mechanical and electrical superintendents and their forces. Their success in turn is dependent, not only on their keeping in close touch with the condition of all machinery from day to day, knowing when replacements due to wear will have to be made, anticipating even the breaking of a weak part, but also to a large extent on the resources the repair departments have at their disposal.

An intimate association with the different classes of machinery will soon make manifest the more frequent breaking or necessary replacing of one part as against another, and it is from this actual experience that one is enabled to determine the number as well as the kinds of spares it will be necessary to carry.

Steel plant practice, in order to meet the extremely hard and continuous service, has made use of all resources available; we might mention the use of very low strains, the more liberal use of steel castings, the use of rolled steel wherever possible for gears, wheels, etc., and the elimination of cast iron except where stability is required or severe strains are absent or where subjected to abnormal heat.

However, wear cannot be avoided and continues until replacement is necessary or breakage occurs, also accidents due to the unexpected, as explosions, cold steel in rolling, etc., and those due to mistakes in judgment, all leave their share of broken parts to be replaced. In addition to these we have the replacements made necessary through constant exposure to excessive heat, such as ingot molds, stools, furnace doors, valves, etc. The repair facilities, therefore, loom up as the mainstay of continuous operation so necessary for the final success of the plant.

The preparation of spare or repair parts may be divided into two distinct operations and classes of facilities:

A. The making of the rough materials: 1. Iron foundry. 2. Steel foundry. 3. Roll foundry. 4. Brass foundry, etc. 5. Pattern shop and pattern storage building.

B. The finishing of the rough materials: 1. Machine shop. 2. Electric repair shop. 3. Forge shop. 4. Pipe shop. 5. Structural or boiler shop. 6. Roll shop. 7. Locomotive repair shop.

The Making of the Rough Materials

This classification leads us to the consideration of foundries for iron, steel, brass, etc. Other rough materials, such as structural shapes, plates, forge steel, etc., can readily be eliminated from our consideration, as they are products of steel plants and each plant would furnish all of this class of rolled material that comes within its schedule. The question as to what extent these facilities should be included in steel plant equipment is purely an economical one.

We have in mind a moderate size steel plant completely equipped for the successive processes from the ore to the finished billets, tin bars and rails, having a capacity of 90,000 to 100,000 tons of rolled steel per month, which used the following tonnages of repair castings in the year 1913:

	Tons	Number of pieces
Iron castings	1,398	23,377
Steel castings	1,058	6,937
Rolls—steel	722	206
Rolls—iron	606	216
Brass castings	18	13,400
Babbitt	64.5	....

THE IRON FOUNDRY

The iron castings used in repairs may be divided to advantage into two classes: 1. The simpler and easily molded castings. 2. The complicated castings.

There can be no doubt that a foundry having ample facilities for making the simpler iron castings would be advantageous both from practical and economical standpoints, especially when we have in mind the possible location of the foundry readily accessible to the blast furnaces, using the hot metal direct for all castings such as floor plates, wearing plates, mold stools, etc., in fact for any castings which do not have to stand severe working strains. This has been demonstrated at some plants in the making of all kinds of open sand castings at the end of the furnace cast house, making use of the hot metal direct from the furnaces. Of course this practice is limited by the small amount of space available.

As to the complicated castings, requiring special molding facilities, complicated core work, etc., on account of their infrequent occurrence, there would be a question as to the advisability of making these, and the solution can only be found in local conditions. The answer is dependent upon: 1. The number of these castings, and their resultant tonnage. 2. The proportion of skilled versus unskilled labor required.

In general, it would not be an economical proposition for a moderate size steel plant to be equipped for taking care of special high-class foundry work, because a single plant would not have sufficient work of this kind to keep their expert men busy and skilled labor would be working on the rough class of work.

*Paper presented before the American Iron and Steel Institute, Birmingham, Ala., October, 1914.

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THE STEEL AND ROLL FOUNDRIES

The steel foundry, as also the roll foundry, as a plant facility can be fairly questioned as to economy when dependent upon a single plant for their tonnage and also on account of their special requirements both in labor and material. These foundries necessarily carry a considerable overhead expense and a lack of tonnage is fatal to their success.

The steel foundry based on acid or basic open-hearth furnaces requires almost continuous operation in order to keep the furnace repairs within reason. The available tonnage of steel castings based on figures previously given is about 1058 tons annually, or an average of 3.5 tons per day. This would mean a one-furnace foundry running about one heat per week, a serious condition for open-hearth practice, and one not to be considered except in direct connection with open-hearth steel plants, so that part of the open-hearth product can be readily diverted to the foundry, thereby saving the cost of remelting and making it possible to obtain the advantages due to continuous operation of open-hearth furnaces. Interrupted open-hearth service is detrimental, either from the alternate cooling and heating up of the furnaces, or the continuous heating required between casts with large idle periods becomes serious from an economical standpoint.

THE BRASS FOUNDRY, ETC.

The brass foundry as well as the babbitt pot should be universal plant facilities for the following reasons:

1. The small amount of space required.
2. The small investment necessary.
3. The large number of brass castings, such as bushings, etc., required and available for the brass foundry and the numerous bearings, slides, boxes, etc., which require babbitting and are available as a source of revenue from the making of babbitt.
4. The fact that these two materials, brass and babbitt, are largely used throughout all machinery to take the brunt of the wear and require frequent replacement.
5. On account of the rough service, a cheaper grade of babbitt can be used successfully on most of the mill machinery.

THE PATTERN SHOP AND PATTERN STORAGE BUILDING

The pattern shop and pattern storage building have always been classed as an important plant facility in connection with repairs:

1. On account of the necessity of patterns.
2. On account of the repeated use that can be made of these patterns.
3. The necessity of owning these patterns in order to make their repeated use available, as well as to facilitate procuring competitive prices on the castings.
4. The fact that these patterns are destructible and should not be subjected to excessive handling or exposure to weather requires that they be properly housed.

The Finishing of the Rough Materials

This covers the shop facilities with which every plant is equipped to a greater or less extent, and is based not only on its economical value but also on its practical necessity. Shop facilities are the rock bottom on which successful and continuous operation depend. To what extent they are desirable or economical may be broadly stated as follows:

A modern steel plant should have sufficient shop facilities to take care of all ordinary repairs by working day turn, thus taking advantage of the maximum amount of light possible. This then leaves a margin for exceptional repairs or even considerable work on the finishing of materials for construction purposes by working night turn.

In this way it is possible to get the best results during normal running of the plant, and we can still make use of the facilities to great advantage during construction or reconstruction periods. It is due to this that we find such extreme variations in shop equipments, the poorly equipped plant being forced to run their shops more or less double turn, at a sacrifice of economy and flexibility in capacity.

The shops, in general, should be centrally located, easily accessible, and should have good roadway and track connections with all parts of the plant. It is also very important that considerable space be allowed for future extension of these shops in order that they may keep up with the growth of the steel plant. For the proper storage of general supplies the shops should have a storeroom for classifying and keeping record of all supplies which, due to their size, would be lost, or, due to their deterioration, would be spoiled if stored in the open. There should also be a general yard for the storage of materials in the rough provided with proper handling facilities for the storing and handling of these materials. All such facilities tend to make this material more available as well as more easily accounted for, reducing loss or unnecessary duplication.

THE MACHINE, ELECTRIC REPAIR AND FORGE SHOPS

The most important repair facility for the finishing of the rough materials is the machine shop, and closely allied with it are the electric repair and forge shops. The electric repair shop has a great deal of its work done in the machine shop and a large proportion of the product of the forge shop has to go to the machine shop for final finishing. The work of these three departments either overlap or the one does the preliminary work for the other. It would seem justifiable, therefore, to consider the advantages accruing by concentrating these shops so that ready communication and transfer of materials from one to the other may be had and the duplication of machinery for similar kinds of work may be avoided.

The final results obtained from the use of these repair facilities both as to amount of output and economy will largely depend upon:

1. That ample floor space has been provided for the final fitting, assembling and loading of materials.
2. That proper handling facilities, cranes, track system, etc., are available.
3. That the equipment has ample capacity.
4. That the large machinery be placed so that materials may be handled to and from it by means of the crane.
5. That ample working space be provided around machinery to make it accessible and safe.
6. That a maximum amount of light as well as ventilation has been made available.

THE SHOP EQUIPMENT

1. The most important machine shop tool is the lathe, being capable of doing all kinds of work, such as boring, facing, drilling, threading, and with special attachments may be called our most universal and adaptable machine. The lathe equipment covers a very large field in repair work, which accounts for the variation in sizes and lengths of bed required. Sizes range from 14 to 60 in., with

the lengths of the bed running from 6 to 30 ft.

2. Equipment should have ample capacity, for instance:

Lathe beds should be of sufficient length to prevent the necessity of turning the piece end for end in order to complete the job.

The large planer should be provided with a removable housing on one side so that additional flexibility may be had as to the maximum width of piece that can be finished, and at the lowest first cost.

Planers should be equipped with side heads in order to eliminate as much resetting as possible.

3. Additional serviceable tools which are gradually becoming standard on account of their adaptability should be provided:

The horizontal boring mill capable of milling, slotting, boring, etc., is now recognized as a most useful tool.

The turret lathe for the duplication of parts is a very economical tool and flexible as to the kinds of work it can do.

The gear cutter or planer, due to the increased use of cut teeth in general mill gearing, is fast becoming a necessity.

4. Machine shop tools in general, such as planers, drill presses, shapers, slotters, bolt cutters, key seaters, and grinding machinery have been fairly well standardized and the choice between the different makes is largely a question of design as regards stability, accessibility and simplicity.

5. The forge shop tools are few, outside of the number of forge fires necessary. The steam hammers ranging from 1500 to 5000 lb. weight of forging head are in general use, although the rapid forging press is now receiving considerable attention due to its reputed economy as well as the claimed superiority of its product.

THE PIPE SHOP AND STRUCTURAL OR BOILER SHOP

The pipe shop, as well as the structural or boiler shop, should be conveniently located. Floor space for working and storing materials is here a most essential factor. In both cases the total machinery required is small owing to the sameness of the work performed and the fact that the work is limited to a single field. In neither case is the product subjected to wear, breakage, etc., to so great an extent as to the products of the other shops. Both are important plant facilities, however, and the economies resulting from their work, as well as the prevention of shut-downs or delays, well warrants their being equipped with proper facilities and ground space. The machinery required is of standard design. In equipping the boiler shop, stability as well as capacity of the tools should be considered. In general, punches should have a capacity up to 1 in. diameter through 1-in. plate, and shears up to 1 in. thickness.

THE ROLL SHOP

The roll shop is a very special repair facility devoted to the turning up of new and the redressing of worn rolls. Owing to the number of products from our rolling mills and the necessarily frequent roll changes, due either to wear or to changing over to another product, the number of rolls in stock has become a most important factor, so that this department should be thoroughly equipped, not only with the necessary roll lathes, roll and neck grinders, etc., but also with proper handling facilities and roll storage racks in order that all rolls may be readily accessible. Some system of records is also essential to insure that the proper rolls as well as the stock supply of rolls will be available.

THE LOCOMOTIVE REPAIR SHOP

The locomotive repair shop is becoming more and more important. The number of broad and narrow gauge locomotives necessary to take care of the inter-mill and department work, and the frequent inspection of each locomotive as required by law, as well as the repairs necessary demand recognition. While all repair parts can be finished by the different shops, it is desirable to have a separate building for preparing the engine to receive these parts. It is more convenient, when possible, to run the locomotive in as well as out of the repair shop under its own steam. This means a considerable steam and smoke nuisance when blowing down, cleaning fires and starting fires, and would be objectionable unless done in a separate building. Also repair pits are necessary, and the tracks together with the pits make the floor space unavailable for other use.

SPECIAL FEATURES

1. The thermit process can be used to quite an extent and to advantage in repair work, especially in repairing broken castings of considerable value which otherwise would have been scrapped. Necks have been built up successfully on broken mill pinions and with an increase in strength over the original casting. Locomotive frames have been welded, building a section at the point of fracture, increasing the strength of the frame. There are many heavy welds which can be made better by the thermit process than in any other way. The equipment required is negligible, but its successful use requires some experience.

2. Oxy-acetylene, etc., has proved its usefulness as a repair facility. The apparatus is portable and capable of both cutting and welding, and has been used in welding up seams on blast furnace stoves without removing any of the brickwork and no calking was afterward necessary. Locomotive frames have been repaired, stay bolts, fire-box and warped sheets can be cut off, cracks in fire-boxes have been welded. It has been used for welding up broken shafting, welding and building up teeth on gear wheels, welding defective pipe, welding up cracks in furnace shells, and stopping up rivet holes. In fact, its use has become very general and has resulted in marked economies in repair costs.

3. Portable rigs, such as the cylinder boring rig, crank-pin turning devices, drilling outfit, etc., are very successful where it is impracticable to do this work except in place.

ORGANIZATION

The results obtained and the extent to which delays are eliminated again depend upon the initiative of the mechanical and electrical departments. Complete and thorough organization, with each branch knowing what part it will have to play, and with all branches harmoniously shouldering their responsibilities, forms the essential factor which through the use of the repair facilities makes possible the successful operation of a steel plant.

Discussion by H. L. Bodwell*

It will give me great pleasure if, by adding a few remarks to what has already been said, and at the danger of some reiteration, I can present any evidence which will assist in drawing to this department the important consideration which it deserves.

The cost of labor and material in repairs has been found to run from 8 to 12 per cent. of the cost

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above net metal in an open-hearth plant, and from 20 to 25 per cent. in a blooming and bar mill. When it is considered that, in case of a breakdown occurring during operations, the cost of making the repairs is but a fraction of the cost due to loss of production, it can be readily appreciated that the repair department of any steel plant should be so organized and equipped with spare parts and appliances for doing the work as to be able to handle with dispatch any emergency which may arise.

The extent to which it is advisable to carry the equipment of a given plant for doing its own manufacturing of spare parts and new machinery and the question as to the advisability of installing steel, iron and brass foundries for the casting of parts for these purposes constitute an economic problem for each individual plant management to solve.

ADVISABILITY OF INSTALLING FOUNDRIES

Any works having an open-hearth department and not large enough to warrant a separate steel foundry can, in the writer's opinion, make with economy most of its own steel castings, especially those of a rougher nature, if room be provided for a molding floor located somewhere under the open-hearth ladle crane runway. If there are no suitable annealing furnaces available in some other department of the plant, facilities for annealing the castings must also be provided.

With the steel foundry thus located it is a simple matter to swing a ladle of any suitable heat of steel over the molds and, after filling them, to teem the remainder of the heat into the ordinary ingot molds. It is the writer's experience that castings can be produced in this way for less than 2c. per lb. total cost.

It is not economical to maintain a separate steel foundry department unless steel castings be a part of the commercial output of the plant or unless the plant be large enough to consume a sufficient tonnage of castings to maintain a steel furnace of at least 15 tons capacity in constant operation. This statement may be somewhat modified, however, if advantage is taken of some of the special furnaces of smaller capacity which have been perfected, such as the Carr or Wills or some form of electric furnace.

The advisability of having an iron foundry is doubtful unless there be local requirements of sufficient extent to justify the necessary plant and organization. In most steel works the required tonnage of the smaller cast-iron parts used in repair work is comparatively small, and the tendency is for these requirements to become smaller. A majority of the parts of all classes of rolling-mill machinery formerly made of cast iron or to-day made of cast or forged steel on account of the greater reliability of the latter under severe stresses. Those parts which are necessarily of iron usually demand castings with special qualities more easily obtained from engine builders or foundries with long and expert experience in making the class of goods required.

If there be blast furnaces in connection with the plant, it will no doubt be found advantageous to make certain castings such as ingot molds, stools, floor plates, etc., from direct metal.

A brass foundry is of special convenience in any plant on account of the immense number of small brass castings used, and such a foundry should be included in the equipment if the amount of castings required is sufficient to warrant the employment of expert supervision. While the plant necessary for casting brass is not very large or very expensive, it is of the utmost importance that the castings shall be of the highest quality.

SPECIAL PROCESSES

The utilization of special processes, such as thermit welding, arc welding, autogenous welding and cutting by oxy-acetylene, blaugas and oxygen or liquid gas and oxygen, will be found of great advantage under certain conditions. The use of gears, pinions and spindles with the wearing faces treated by some special hardening process, such as the Stroch or Gebhardt, will result in longer life and reduced costs of upkeep in many cases. We have found it especially beneficial in the case of table roll pinions and spindles.

Thermit welding has been found very useful and reliable on certain classes of repairs to steel castings and forgings. We have used it successfully many times in repairing broken locomotive frames without a single failure; also in casting new necks on blooming-mill table rolls and repairing cracked gears; in several cases casting new necks on blooming-mill rolls, casting new necks on bar-mill pinions and various other jobs of more or less importance.

The application of the science of arc welding to the building up of the wearing faces of wornout spindles has been found especially useful. In some cases, notably in the repairing of blooming-mill vibrating spindles, it is of special advantage in forming a hardened face on the wearing parts, which can be done by the use in the welding process of a special high manganese steel in conjunction with the soft steel commonly used. A spindle built up in this way has been found to last an average of three to four times as long as a new untreated spindle.

Another useful application of arc welding is in the building up of worn areas on steel castings which have been in use, thus allowing the casting to be remachined to the original dimensions.

Autogenous welding, where used with discretion, has found some useful applications, resulting in large savings in cost and delays. The writer has in mind one case in particular where one of the line-shaft bearings of an ingot stripping crane had broken off the end carriage of which it was an integral part. This was welded on again with an oxy-acetylene torch and a complete permanent repair made in four hours' time. Ordinarily a new end carriage would have to be installed, which in this case, on account of the location, would have taken two days and cost about $500. On another occasion an oil box on a motor had been broken off. This was welded on satisfactorily in a very short time, saving the cost of a new frame. This method of welding is also useful in making guards for machinery, which present a very neat appearance and can be made in this way at lower cost than by riveting.

On the other hand, this process of welding is not always absolutely reliable, and good judgment must be used in deciding whether its use shall be attempted or not in any given case. A good weld can be made only by an experienced operator, and means must be at hand, in the case of odd shapes, for preheating the parts to be welded and for annealing them after welding.

The cutting torch has possibly an even wider application in a steel plant than the welding torch. It is useful in cutting plates into various shapes, cutting and fitting structural work, wrecking steel structures, cutting out rivets or bolts, drilling holes in difficult places, cutting off links, bolts, nuts or tie rods, in taking machinery apart, and many other things too numerous to mention.

We have found it a useful equipment for the bar mill to have constantly at hand for cutting up cobbles which occasionally occur. On a number of occasions delays of several hours have been avoided in this way.

The value of compressed air as an aid to the repair department can scarcely be overestimated. It should be piped to all parts of the plant so as to be available at all times for any repair job. It can be used to advantage in running pneumatic tools, such as drills, chippers, riveters and hammers, and for many other purposes. Along crane runways it is especially useful for blowing the dust out of crane motors and for cleaning off the cranes. It is especially adapted to cleaning out motors in any dusty location and in the power plant for keeping generators free from dust.

Equipment of Repair Shops

The writer has thought it best, in taking up the subject of equipment, to consider a plant of about the size of those with which he is most familiar: one having an open-hearth and bar-mill department capable of producing about 22,000 gross tons per month and finishing departments to take care of this output; in this case, sheet mills, annealing and galvanizing departments.

The repair department of a plant such as described will ordinarily consist of a machine shop, blacksmith and forge shop, electric shop, pipe shop, boiler and plate shop, carpenter shop and pattern shop.

The location provided for these shops in relation to each other and to the producing departments of the plant is of the greatest importance as affecting costs of upkeep and repairs. This feature should be given due consideration in the design of the original plant, and provisions made for future extensions in order that the shops may be enlarged as the plant grows and their efficiency as affected by accessibility from other departments be maintained.

MACHINE SHOP

The machine shop is the most important unit in the repair department, and its design and equipment should be such that it can take care of all ordinary break-downs which may occur and manufacture all spare parts of whatever size may be frequently needed. In the design of the building, due consideration must be given to the important features of crane service over all heavy machine tools, lighting by day and night, heating and ventilation. Ample room should be allowed around machine tools and for erecting and assembling so as to avoid congestion.

The type of floor to be used is often a difficult question to solve. We have gotten by far the best results from wood blocks laid on top of concrete. This construction is very durable, can be easily repaired and is comfortable for the men to stand on. It is far superior to plank, cement, brick or steel.

Proper provisions should be made for wash and locker rooms, for sanitary closets and, when desirable, a room where the men can eat their lunches. These accommodations are equally necessary in all of the other shops to be described.

While it is generally desirable to have all machine work done in one central shop, there may be cases where economy will result by the location of smaller branch shops in isolated departments where some of the constantly recurring repair work, peculiar to those departments, may be taken care of, thus avoiding the delays incident to the transportation of parts back and forth to the main shop.

It is desirable to carry on more or less new work, thus rendering available a force of men for any extra amount of emergency work. In general it is not advisable to equip a shop for taking care of the largest work which may arise, as this involves an investment in large and infrequently used tools. It is more economical to carry in stock such larger spares purchased from outside concerns.

The machine-shop equipment for a plant of the size under consideration might be given tentatively as follows:

Ten lathes of various sizes from 14 to 60 in. and with lengths of bed sufficient to take care of all requirements.
One 72 x 72-in. planer with 21-ft. bed equipped with two heads on cross rail and one side head.
One 48 x 48-in. planer with 10-ft. bed and two heads on cross rail.
Four shapers, 20 to 36-in. strokes.
Two radial drills of 6-ft. radius.
One boring mill, 16-ft. capacity.
One boring mill, 4-ft. capacity.
Two gear cutters for cutting spur gears, bevel gears and worm wheels.
One slotter.
One milling machine.
One keyseater.
Two bolt machines, one 2 and one 3½ in.
One cutting-off saw.
One centering machine.
One 300-ton hydraulic press for making press fits.
Also such additional or special tools as may be necessary in order to take care of any special requirements of the plant.

There should be a laying out table provided, and a bed plate in the floor for use in assembling and setting up jobs for portable tools.

MACHINE-SHOP AUXILIARIES AND FEATURES

It is important that a tool room of ample capacity be provided, where all tools and supplies be kept, such as lathe and planer tools, drills, cutters, reamers, arbors, etc.

This room should be equipped with a universal tool grinder, on which to grind all lathe and planer tools, also a twist drill grinder, cutter and reamer grinder and tool-room lathe.

A heat-treating and tempering furnace should be used for hardening and tempering all tools.

There should be attendants in this room, whose duty it is to keep all tools and appliances in first-class condition, and to give them out on a checking system.

The remarkable development in recent years of high-speed-tool steel has rendered obsolete nearly very class of machine tool more than eight or ten year old, and it will generally be found a profitable investment to replace all such tools, if in constant use, with those of late design.

In our own shop several heavy-duty machine tools have been purchased in the last few years, such as lathes, shapers, a planer, radial drill, gear cutter, etc. Tests made on these machines, compared with similar tests made on the old machines which they have displaced, have shown a superiority for the new machines of from 300 to 1000 per cent. The advantage of these improvements in capacity is obvious when we consider how much time is saved on any repair job.

There should be a cost system in every shop, whereby the labor and material on every job may be kept track of. This will be of great advantage in enabling those in charge to determine the best and most efficient methods to follow on various recurring jobs, whether the maximum production is being obtained from each machine, and will give data on which to base accurate estimates for new work.

A storehouse for castings should be maintained in conjunction with the machine shop, where all

smaller castings may be stored. Easy access should be provided to the yard where the larger castings are stored.

BLACKSMITH SHOP

The blacksmith shop may be considered, in a plant of this size, as a part of the machine shop. It is convenient in general to have it located under the same crane runway so that the forgings produced can be conveniently transported for finishing or loaded on cars for transferring direct to other departments, if no finishing be required.

The equipment of a shop for the size of plant under consideration should consist approximately of six single forges for hand work, one 600-lb. steam hammer and one 2000 or 3000-lb. steam hammer, or one 300-ton forging press.

A steam hydraulic forging press is superior to a steam hammer, both from a forging cost and from a quality standpoint, provided there be sufficient quantity of duplicate work to make possible the entensive use of dies.

There should be a rack for the storage of the supply of bar iron, within the department, and a shear for cutting bar iron.

All forgings should be analyzed before machining to check the heat analysis from the open-hearth department. Physical tests should be made on all forgings of importance.

ELECTRIC SHOP

The electric shop should be located within the same building and under the same crane runway as the machine shop, or at least in the immediate vicinity. It should be equipped with sufficient machine tools, such as lathes, shapers, milling machines, drill press, etc., to take care of its own work where this work is of sufficient quantity to keep these machines employed enough of the time to warrant the investment involved.

The electric shop should be amply equipped with such special tools as are necessary, such as an armature winding and banding lathe, coil winding machine, balancing machine, metal cutting band saw, shears, screw press, grinders and polishers, mica undercutting machine, etc. A toolroom is of advantage here as in the machine shop, where all small tools and appliances can be kept in order and given out on check.

PIPE SHOP AND BOILER SHOP

The pipe shop for a plant of this size should contain about the following equipment:

One pipe cutting and threading machine with range for ⅛ to 2-in. pipe.

One pipe cutting and threading machine with range for 1 to 6-in. pipe.

One pipe cutting and threading machine with range for 2½ to 12-in. pipe.

One cutting off and threading machine with revolving die head for cutting and threading bends with a range of at least 1 to 6 in.

One 30-in. drill press.

All should be motor driven and reversible.

There should be a pipe bending machine, forge for heating pipe, bending table, pipe and machinist vises, emery wheel, etc.

An overhead floor operated crane is advisable for serving the heavy pipe machines. There should be a toolroom equipped with the various hand tools and appliances.

There should be a storeroom in connection with this shop, where all kinds of fittings and valves can be kept under the charge of a clerk also having charge of the supply of pipe, which should be kept in an easily accessible rack. He should keep a record of all supplies used by the shop for each department of the plant.

The boiler shop in a plant of this size can take care of all plate work and such structural work of a minor nature as it may be desired to fabricate locally. It will take care of the repairs to locomotive boilers as well as all other boilers, and can, with advantage, have within its scope the construction of guards for machinery and the construction of other safety devices.

It should be equipped to manufacture and repair all such appliances, made up of boiler plate or structural material, as are used in the various departments of the plant in sufficient quantities to justify the capital investment in equipment. This would include open-hearth ladles, open-hearth furnace pans, open-hearth charging boxes, annealing boxes and galvanizing pots.

The shop equipment would include punches, plate and angle shears, bending rolls, riveting machines, a rivet furnace, circle shear, cornice break, cold saw, pneumatic tools and air compressor.

CARPENTER SHOP AND PATTERN SHOP

The carpenter shop, in order to handle with economy all work which may come to it, should have the following equipment: A single surfacer, jointer, rip saw, cross-cut saws, band saw, band rip saw, turning lathe, shaper, knife grinder, saw filing machine, mortising machine, tenoning machine, boring machine, etc.

There should be an exhaust system connected to each machine for removing all dust and shavings. This improves working conditions and reduces the fire risk.

There should be a lumber shed in convenient proximity to the carpenter shop.

A well-equipped pattern shop is of great importance to any plant of considerable size. Here all patterns of a nature peculiar to the machinery in that plant can be made and stored ready for instant use in case of emergency. Patterns of special design for use in emergency repair work can be quickly made, or existing patterns can be altered to suit different conditions or for greater strength. This shop should be equipped with a lathe, jointer, band saw, rip and cut-off saw, shaper, surfacer, trimmer, saw filing and setting machine, etc. Fireproof storage should be provided for pattern lumber and for the storage of patterns.

ORGANIZATION

While it is of great importance that a plant be equipped with ample facilities for carrying on its repair work, it is equally important that the personnel of the organization which has all of these facilities in its charge be of the highest quality obtainable.

At the head of this department should be the chief engineer or mechanical superintendent, supplemented by the electrical superintendent, whose importance is becoming greater and greater as the electrification of the modern steel plant becomes more and more complete, and by the superintendents or foremen of the other departments, each of whom should be a trained specialist in his own particular branch of the industry.

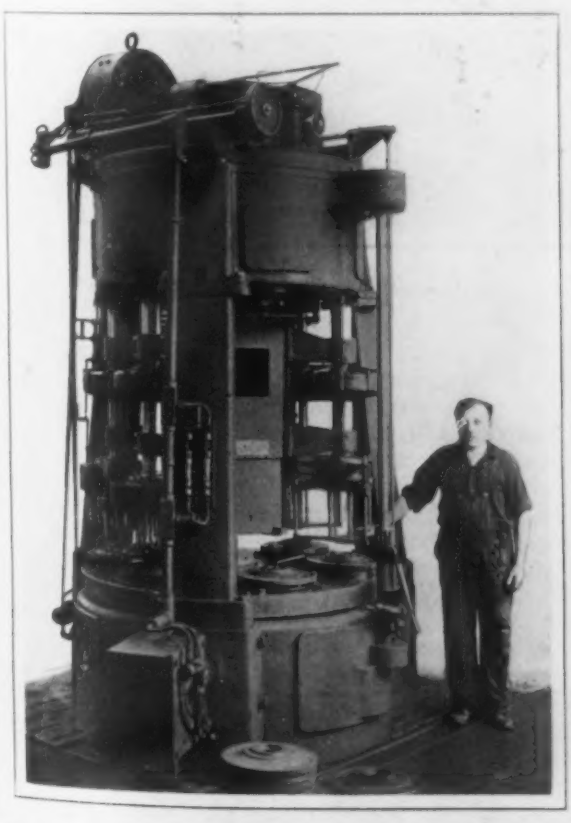
The heads of this organization should be men of trained technical ability supplemented by wide practical experience. They should be equipped with a large portion of that native ingenuity which will enable them to solve the many unexpected and perplexing difficulties constantly arising in this business. Above all they should have the executive ability which will draw forth that unselfish and co-ordinate effort from their subordinates so essential to the efficiency of any organization.

Large Semi-Automatic Drilling Machine

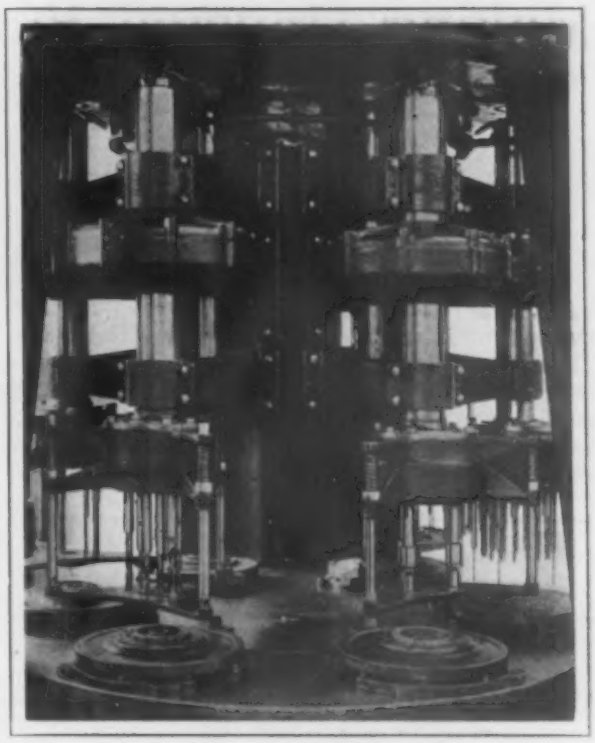
Three large semi-automatic multiple-spindle drilling machines have been recently supplied to the Ford Motor Company by the Baush Machine Tool Company, Springfield, Mass. They are designed for drilling flywheels and can also be used for multiple drilling, reaming, counterboring and similar operations. It is pointed out that with this machine the short distances between centers do not introduce any complications, as the holes can be divided up among the various heads, or heavy and light drills can be used at the proper speeds and feeds by grouping them together.

As will be noticed from the accompanying illustrations, the machine is of massive design, weighing approximately 20,000 lb., which is calculated to secure large output. The table is rotated by a Geneva stop, the mechanism for which lifts the table and supports it while in motion on a center pintle that rides on a ball bearing. It is emphasized that with this arrangement the table can be moved with a minimum effort. A cam-actuated, hardened steel locking bolt comes into play just before the table is lowered to its working position, where it rests on a rail, which is slightly smaller than the outside diameter of the table. This rail is carried up inside the flange, an arrangement which is relied upon to protect it from chips.

Each head is counterweighted and the construction is of the builder's standard type, as far as the spindle cluster. The cluster furnished can be removed easily and a different one substituted, which would be a regular adjustable head of the builder's standard construction. The feed is controlled by a barrel cam with straps to give a quick approach, feed and return, the use of which is relied upon to give the necessary feed or travel for the several tools. In the feeding position the operator has the switch and motor starting apparatus at his left, while on the other side is a small lever that stops all feed mechanism, including the indexing of the table, instantly. In this way a convenient and practical arrangement providing for an absolute control of the machine is secured. The machine is driven by a direct-connected, 25-hp. Westinghouse motor, mounted on the head and transmitting its power through gearing.



The Largest of Three Semi-Automatic Multiple-Spindle Drilling Machines Recently Supplied to an Automobile Builder



A Nearer View of the Drilling Heads

In doing the work for which these machines were designed there are 81 drilling operations to be performed, and the time required is 54 sec. for each piece. The first operation is the drilling of 16 holes in the inner circle through metal approximately 1⅛ in. in thickness and 16 holes on the outer circle half way through the same distance. After this the inner set of holes are counterbored and the outer ones drilled through with a smaller drill, the result being 32 counterbored holes. Three half-round faces in the hub of the wheel are milled or counterbored next, after which nine holes are drilled near the center, the final operation being the reaming of five holes. Each of the tools is operated at the speed and feed designed to give the best results, and a jig is provided for each cluster and used at that one station only. The flywheels are placed on a supporting block and the wheel is secured by an expanding center. The counterbore in each wheel is located under the jig, the taper leader entering as the jigs come down to the working position. A flat dowel in the supporting block which registers between two jaws on the extreme outside portion of the jig is relied upon to secure the wheel against rotation.

Making Ferromanganese at Dunbar

No. 1 stack of the American Manganese Mfg. Company, Dunbar, Pa., is in successful operation. In the first week the furnace ran on 20 per cent. spiegeleisen, then changed to foundry iron, and for two or three days last week it was operated successfully on ferromanganese, running from 30 per cent. at the start to as high as 44 per cent. An output was made of 500 tons or more of ferromanganese, which was shipped to Eastern consumers. The stack is now running on foundry iron, but may change over to spiegeleisen or ferromanganese again in a short time. Shimer & Co., 1511 Oliver Building, Pittsburgh, are selling agents.

Making Unusual Pumps for New Orleans

How Foundry and Machining Problems Involved in Manufacturing Eight 12-Ft. Screw Pumps Were Met by the Nordberg Mfg. Company

BY O. J. ABELL

The Nordberg Mfg. Company, Milwaukee, is building for the city of New Orleans eight 12-ft. screw pumps for the drainage system of that city. These pumps are of unique design and are also interesting from the standpoint of the shop work required in their construction. They are to be used for emergency service in the handling of the very heavy water precipitation in the rainy season, each pump being rated to deliver 550 cu. ft. of water per second, or approximately 300,000,000 gal. per day. The general type of the pump is illustrated in Figs. 1 and 2. The propelling unit consists of an eight-blade runner, illustrated in Fig. 3. The runner chamber is elevated above both suction and discharge basins and the pumps will operate with a lift of 6 to 12 ft., discharging into a basin at only slightly higher elevation than the intake. A striking feature of the design is the cone shaped housing, which completely encloses the main driving shaft bearing, giving a short and stiff driving shaft. The pump is operated under vacuum, and the design presents the advantage of permitting complete access to the operating parts through a manhole, free from water, by simply breaking the vacuum. In starting the pump the runner is set in motion and the pump is then primed with a centrifugal vacuum pump, which process is reversed when the pump is shut down. The runner is driven by direct coupled shaft to a synchronous type motor, running at about 75 r.p.m., the size of the motor varying from 600 to 1200 hp., depending upon the head against which each particular pump will be required to operate.

The molding of the pump castings is largely sweep work in loam, about 25 per cent. only of the castings being made from patterns in dry sand.

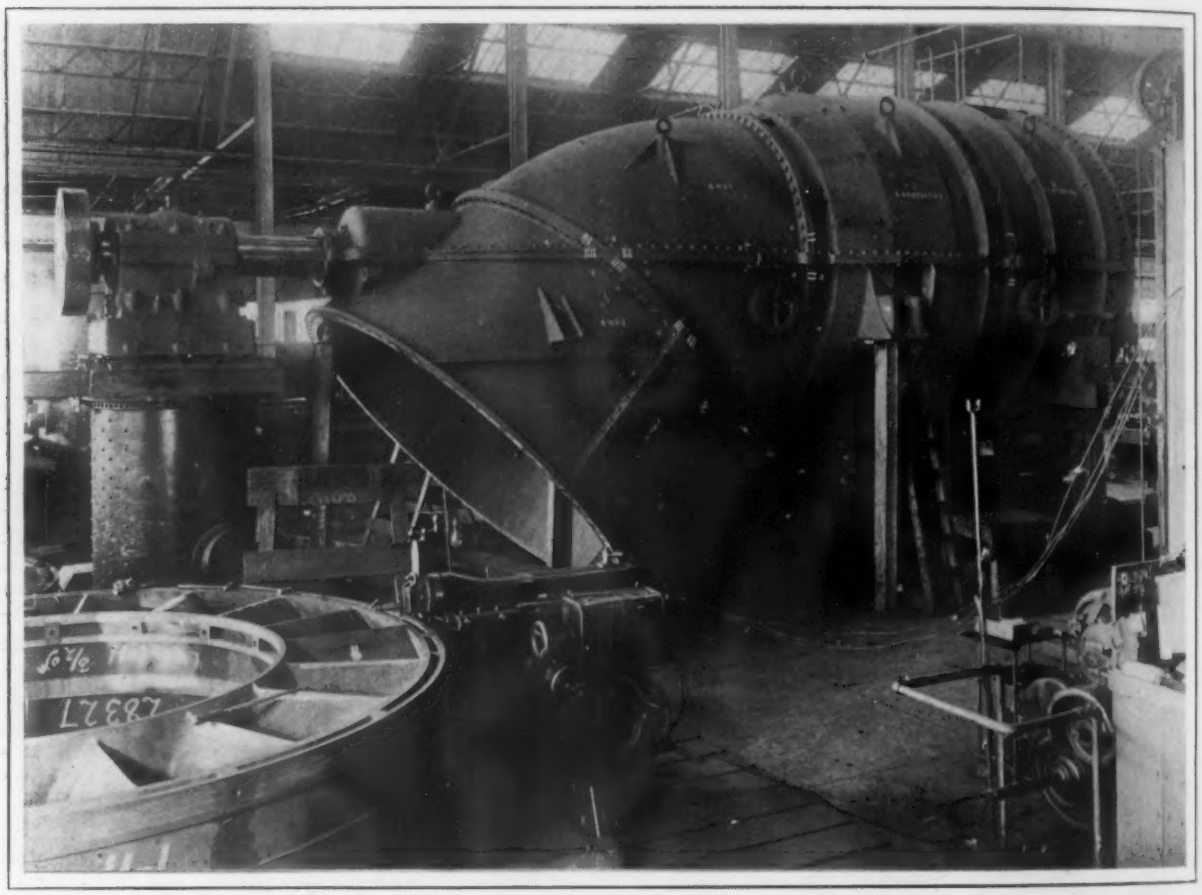


Fig. 1—Side View of 12-in. Screw Pump for City of New Orleans from Suction End; Building at Nordberg Mfg. Company, Milwaukee

For the suction elbows skeleton patterns only are used. As intimated, the inside diameter of the pump casing is 12 ft. This diameter is so large as to require casting the pump shell in such sections as will come within the limits required for shipment. The side view of the pump indicates a number of the joints made in both the suction elbow and the runner casing. But in casting the sections the molds are swept up for casting the complete circumference with cores inserted to split the casting at the joints. In contrast with the overall sizes of these pieces, the thickness of the metal section is only 1⅝ in. This fact, together with the strict requirements as to the quality of the castings, lends considerable importance to the foundry work involved in their manufacture.

For these castings a moderately strong iron has been used, the specifications requiring a breaking strength of 2000 lb. in the test bar. The principal care required was in the avoidance of shrinkage

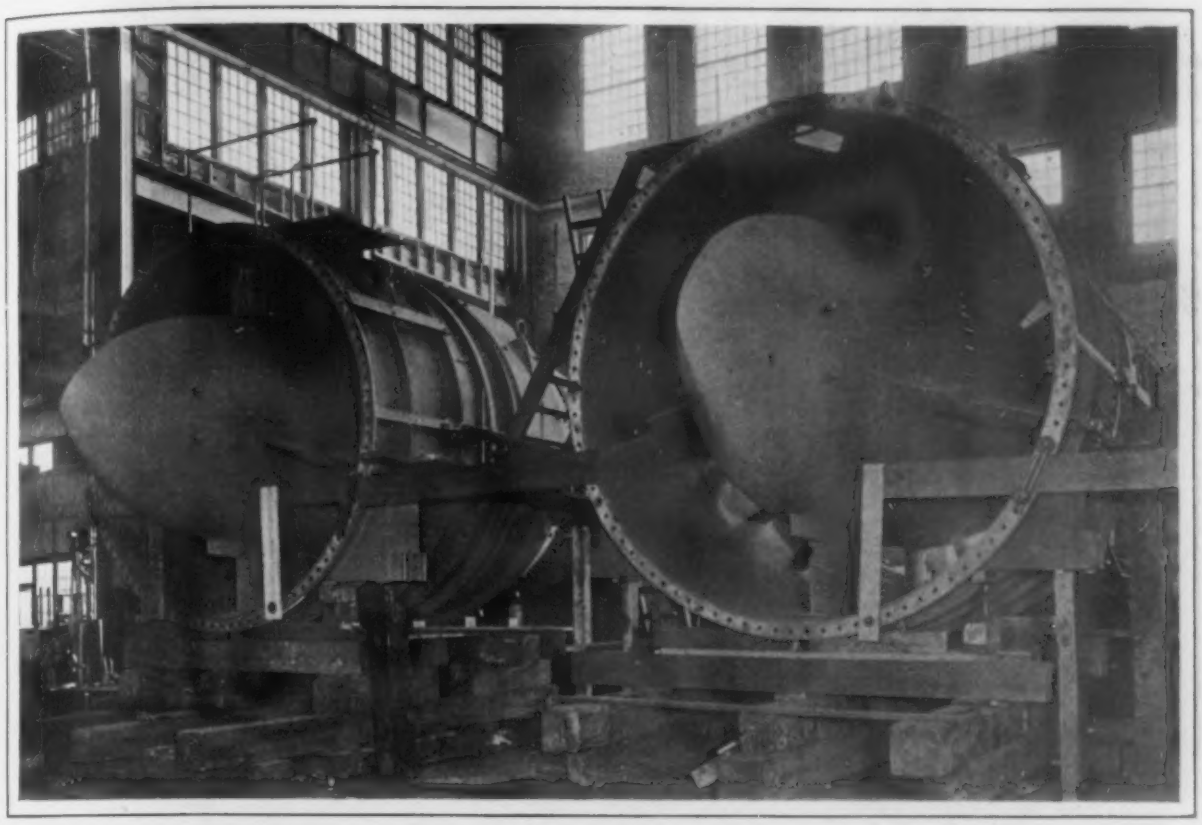


Fig. 2—View of New Orleans Pumps Looking into Discharge End and showing Unique Housing for Shaft Bearing. The Diffusion Vanes are also Shown

strains and cracks, the situation requiring the prompt slackening of the mold by the removal of bricks in the cores after pouring. The large area of the castings and the thin metal section also required pouring with a metal unusually hot. Fig. 4 illustrates one of these molds locked up and about to be poured, the casing sections being cast for the most part in pits. In making these molds the work is very largely comprised in the building of the cheek and the cores, the drag and cope being large metal plates with the requisite openings in the latter for runners and shrink heads. Fig. 5 shows a main core for one of the runner housings, and this illustration also shows at the right the stuffing box cores for one section of the suction elbow, through which the main driving shaft passes.

The cone shaped main bearing housings are split horizontally along the medium line, but are cast in one mold with the joint broken by cores. This mold is made up from a pattern in dry sand, and the particular difficulty is in the making of the cores, which are somewhat intricate, in that

Fig. 3—View of the Propeller, Reproduced from *The Iron Age* of October 22

provision has to be made for the main bearing brackets which are a part of the bottom half of this housing. This core is made in three sections, the two similar top portions, one right and one left, and the lower half. A view of one of these cores is shown in Fig. 6.

The diffusion vane mold is swept up in similar fashion to the sections of the pump casing, the complete circumference of the vanes being cast in one mold, although cores split the casting in two sections. In making this mold, the inside and bottom are swept up in the drag together, the cheek forming the outside is swept up separately, and then placed around the inner portion. The cores are then set in between to give the water

Fig. 4—Pouring the Mold for One of the New Orleans Pump Sections. The Mold is Poured from Two Ladles and has But Two Shrink Heads

openings and are spaced to form the diffusion vanes between. Experience indicated that the discharge side of the diffusion vanes, where accuracy of contour is especially desired, should be the drag side of the mold. A much better edge is obtainable for that side where it is especially necessary, than when the discharge side of the vane is cast in the cope side of the mold. The cope for this mold is simply a heavy metal plate properly faced with loam.

The machining of these castings presents no great difficulties. All horizontal flanges are machined on a planer, and the oblique flanges on the suction elbows are faced on the boring mill. To avoid the use of an angle plate for these cumbersome castings in facing the flanges, temporary lugs are cast on the inside and the castings are blocked up on the table of the boring mill, resting on these lugs at such a hight that the facing tool can be inserted from below, which permits machining the flanges in a horizontal plane.

Fig. 3 shows the machining of the assembled runner blades. These blades are cast in steel, as described in *The Iron Age* of October 22. Some difficulty was experienced in holding the shape of these blades after annealing, and it was found necessary to build a set of cast-iron dies, into which such blades as became distorted could be shaped to the uniform angle required under pressure in a hydraulic press. These runner blades are bolted to the cast-iron hub, the drilling of which is illustrated in Fig. 7. This hub is tapered and for drilling is mounted on an angle plate and turntable, the holes being located by a cast-iron template. The boring of the stuffing box section of the suction elbow on a combination drilling and boring machine is illustrated in Fig. 8.

It is anticipated for these pumps that the design adopted will effect an efficiency approaching 80 per cent. The relation of discharge area through the diffusion vanes and around the cone shaped center to the rate flow of water through the pump has been very carefully determined. It is also anticipated that the placing of the main shaft bearing so close to the runner will materially decrease the shaft flexure and vibration. It materially reduces the cost of the pump, which is an essential item in consideration of the intermittent duty to be required.

The foundry of the Nordberg Mfg. Company is particularly well adapted to the handling of large work such as this, some jobs having run up to 50 tons in weight. It is 400 ft. long, 269 ft. wide, and the two 80-ft. longitudinal bays into which the main floor is divided are spanned and served by two cranes in each bay, with capacities of 30 and 40 tons. Under these cranes there is a clearance of 30 ft. and above them a high monitor roof, which affords unusual light and ventilation. The side bay which occupies the remainder of the foundry width provides for the cupola room in the center, the small work floor at one end, and the core room at the other end. The melting equipment includes two cupolas of 96-in. and 78-in. shell diameter, lined down to 78 in. and 61 in., respectively. From these 20 and 15 tons of hot metal per hour, respectively, is ordinarily obtained.

In the arrangement of this foundry unusual at-

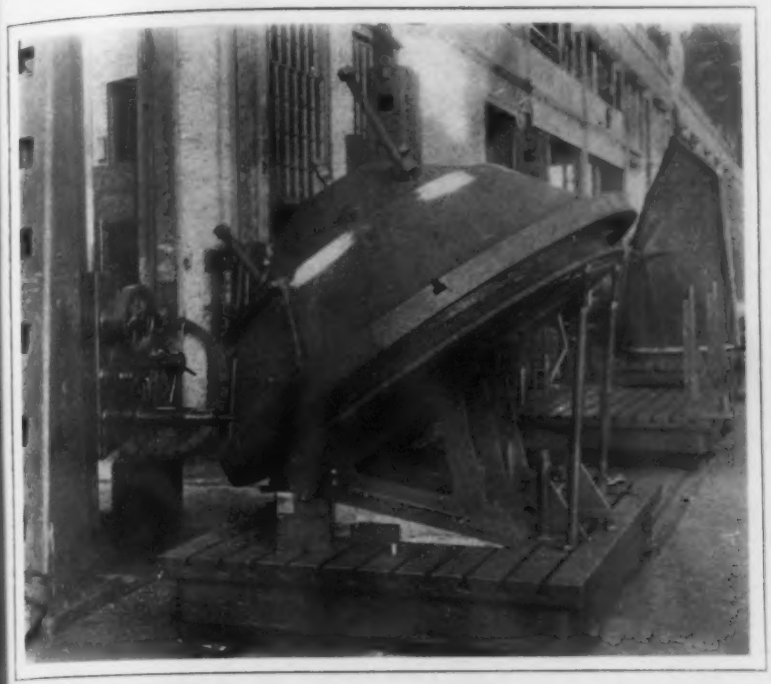


Fig. 7—Drilling the Holes in the Runner Hub for Bolting the Runner Blades to the Hub

After opening bids for furnishing the municipal waterworks system with a new 3,000,000-gal. centrifugal pump and two new boilers, the Common Council of Manitowoc, Wis., instructed the city engineer to prepare plans and specifications for a Diesel engine equipment for the water and light plant. The Busch-Sulzer Bros.-Diesel Engine Company, St. Louis, Mo., submitted a bid of $14,750 for a 225-hp. Diesel engine and $2800 for a generator, or $27,467 for a 500-hp. engine and $3500 for a generator. A bid for steam equipment by the Allis-Chalmers Mfg. Company, pump and boilers, complete, was $11,300.

The United Steel Company, Canton, Ohio, on October 23, took out the first heat of steel from its 6-ton Heroult electric furnace. It was a heat of chrome-vanadium steel. This heat was successful, and the officials of the company are much pleased that the first heat proved to be a commercial product. The furnace was put in operation under the supervision of J. H. Gray, of the Steel Corporation.

Fig. 5—The Principal Core for One of the Pump Sections and the Core for the Main Shaft Stuffing Box

Fig. 6—One of the Sections of the Core for the Main Bearing Housing of the New Orleans Pump

tention has been given to the raw material storage. This yard is 440 ft. long, 80 ft. wide, roofed over and spanned by a 5-ton crane. A spur from the connecting railroads which serve the plant traverses this stock yard at the outer side, and down through the center a depressed track is laid for a transfer scale car. On either side of this pig iron is piled, according to grading, and at one end bins are erected for the storage of coke and sand. These latter materials are handled in large bottom dump buckets for transferring from incoming cars by crane into the bins, while pig iron and scrap are handled by means of a crane magnet. For the elevation of materials from the stock yard to the cupola charging floor a hydraulic elevator is installed.

The J. G. Brill Company, Phila-delphia, has made a reduction of 10 per cent. in the wages of all employees from the president down.

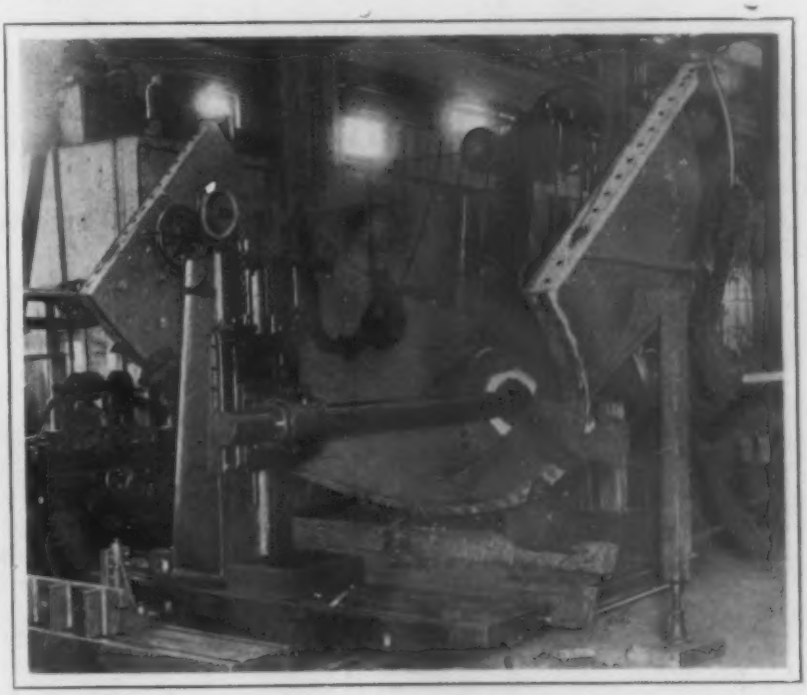


Fig. 8—Boring Out the Stuffing Box for the Main Shaft on the Stuffing Box Section of the Suction Elbow

The Co-operative Store

Industrial Conditions at Jeffrey Plant

Developments of Five Years of Co-operation between Employer and Employees at Works of Jeffrey Mfg. Company, Columbus, Ohio

W. A. Grieves, supervisor of employment and welfare, Jeffrey Mfg. Company, Columbus, Ohio, recently contributed an article to the magazine, One Hundred Per Cent., from which all but the introductory paragraphs are reprinted in the following:

"While the Jeffrey Mfg. Company has always been interested in seeing that good physical conditions existed about the plant, it was only about five years ago that steps were taken for a definite policy of industrial betterment. It has always acted on the belief that that which is good for the employee must be good for the employer, and this idea has constantly been emphasized as each phase of our welfare work has been developed. That this plan has worked satisfactorily and produced results is not due, we believe, so much to anything we ourselves have done as to the fact that it is right and human. The greatest strength and largest hope for the great industrial reforms, which all fair-minded men are seeking, depend upon our finding this meeting ground of common interest and purpose.

"Partnership with our workmen and the desire to realize it with all its benefits, is fast becoming the dominant consideration. Gradually we have reached this point, and are finding the call of duty, with regard to the question of protection of health and limb of our workmen, and many kindred questions lengthening out straight and clear before us, and have found opportunity for accomplishing the needful things waiting at our doors. This is not said from the standpoint of those who have attained, but rather from that of those just beginning to do, and who are finding a sense of satisfaction in working out these problems which have as their supreme aim the workman's right to all that is due him.

EMPLOYEES' AID ASSOCIATION

"After the reorganization of our Mutual Aid Association five years ago, we adopted the plan of strongly urging each new employee of the company to take membership in the association. This method of securing members, of course, has proved tremendously prolific. While membership is not compulsory, the benefits are so attractive that more than 93 per cent. of all employees who did not already have all the protection they could afford to carry, have been secured for membership.

"This has been an excellent protection for our men, as an employee can secure for the small sum of $1 per month as high as $200 in benefits in one year.

Kitchen

Restaurant

Bakery

"Before making self-protection a part of the employees' obligation upon entering our employ, the aid association was continually calling upon the members for special assessments, and frequently appealing to the company for contributions. Under the new plan we have had each year, after paying all claims, $2000 in the treasury.

"Our experience shows that as a rule the average employee will not protect himself unless urged to do so; and while some employers contribute as much as 50 per cent. of the premium to these associations, it does not act as an inducement for the men to join. Given the proper organization, together with due emphasis upon a man's duty to protect himself, and the responsibility of the success of the organization placed entirely upon the men, you can count upon a prosperous association. Men appreciate most that which costs something, whether it be in money or effort in social service.

"About five years ago we made a careful study of the number of men who were off work owing to slight injuries, which in themselves were not serious, but through the lack of proper antiseptic treatment, had become infected. Our records showed that on an average as high as a half dozen men were away from work daily for this reason. As it had always been our policy to pay wages for a portion of the time lost by employees, through injuries, this investigation revealed a condition that represented a two-fold loss. We reasoned that under proper antiseptic treatment these infections would be reduced to a minimum, and not only would we save the amount of the employees' wages, but also the greater loss occasioned by a decreased production.

Works' Hospital

WHY THE WORKS' HOSPITAL WAS PROVIDED

"It was not unusual to find some of our most skilled and highest paid mechanics off work for several days because of infection caused by a slight cut or bruise, and when you count what that may mean in decreased production, not only of the injured man himself, but also the possible hold up of an order all along the line, it is not easy to determine the loss.

"From the standpoint of cold business this condition demanded a remedy. We at once set to work and thoroughly equipped an emergency hospital and placed a regularly graduated physician and trained nurse in charge. Out of some 4000 cuts, bruises, sprains, etc., together with re-dressings to the number of over 4000 last year in our plant, the infections resulting did not average more than two per month.

"We have so many calls from the homes of our employees on account of illness of the wife and children. It was quite common for some of our most valuable men to be away from work on this account. Now, instead of the men going home, the nurse is sent instead. Nine times out of ten she can be of far more assistance than could the father, and this not only saves the time the men would otherwise lose, but is also a great advantage to the company in having the men at work. Then, too, the nurse's work among our women employees is valuable. What our doctor is to our men, the nurse is to our women. They have learned to confide in her their troubles, and she is constantly being called upon for advice and service.

AN EMPLOYEES' RESTAURANT

"A recent and exceptionally successful feature of our welfare work has been the introduction of a thoroughly equipped restaurant and dining room. A committee of employees manage it. The purpose is to give the very best service for the lowest possible cost; and although failure was predicted by many, we have gone right ahead for four years giving excellent service at a most reasonable cost.

"Everything to eat is of the home-cooking variety, and for a cost of from 10 to 20 cents a good, warm meal, served in the most wholesome surroundings, can be secured. Between 500 and 600 are served each day, and our capacity is being strained to the point where we will soon be compelled to provide larger quarters. The company does not contribute anything to this except to furnish the room and light and heat. All help is paid for out of the receipts and we are laying away a few dollars each week for improvements and depreciation of equipment.

BUILDING AND LOAN ASSOCIATION

"Acting on the theory that a community is the most prosperous whose working people have the

Examples of the Conditions of the Factory Yards of the Jeffrey Mfg. Company, Columbus, Ohio

most and best home life, and that the most and best home life conduces to the highest wages, the best education and training and the greatest prosperity of a community, our employees organized a building, loan and savings association. We have now been operating this association for nearly three years and have done over $200,000 business and 69 employees have bought and built homes with this their own money.

"We believe we should assist in every way we can to help our employees save their earnings. We are convinced that it is not so much the intense desire to squander as it is perhaps the lack of an immediate opportunity to save, that men do not save more. Saving money is largely a matter of realizing its importance, and if we help foster any agency that will encourage this sentiment among our employees, we believe it is our duty to do so.

"The building and loan is a potent factor in not only helping the employee save his earnings through which he may get a home of his own, but is most profitable to us in establishing a more permanent constituency of desirable employees.

A CO-OPERATIVE STORE

"About three years ago our employees organized a co-operative store, in which is sold groceries, meats and provisions of all kinds. We also have our own bakery with a capacity of 3000 loaves of bread per day. We bake everything used in our restaurant and sell all we can bake to employees. Bread is sold for 4 cents per loaf and pies, cakes, etc., at equally reduced prices. Our employees are able to save about $10 per month per family over what they would have to pay at the regular dealers.

Lunch-Menu, Jeffrey Restaurant, Wednesday, September 16th, 1914

Roast beef	.04	Cake, pudding, custard dip	.03
Fried liver	.04	Prunes	.03
Veal stew	.04	Sliced peaches	.03
Spare rib dumplings	.04	Ice cream	.03
Mashed potatoes	.03	Cantaloupe	.03
Brown potatoes	.03	Watermelon	.03
Baked beans	.03	Pumpkin pie	.03
Green beans	.03	Banana pie	.03
Potato salad	.03	Apple pie	.03
Cold slaw	.03	Peach pie	.03
Pickled beets	.03	Cream custard pie	.03
Stewed tomatoes	.03	Grape nuts	.03
Sliced tomatoes	.03	Post toasties	.03
Kale	.03	Shredded wheat	.03
Rice	.03	Coffee	.03
Apple sauce	.03	Milk	.03
Stewed peaches	.03	Bread and butter, each	.01
Sliced cake	.01		
Cookies	.01		

We have also started our own dairy and furnish morning milk every day for lunch. This is also sold at a reduced cost for a better quality.

"All this work is carried on by employees, the building and loan being managed by a board of twelve directors and the other features of the work by different committees.

"We feel that this is the kind of welfare work that pays—both our employees and ourselves. The men having full control gives them a confidence that could not be secured otherwise. We have now been conducting it long enough to know what it is and can be made. It is no longer an experiment.

"You may ask of what direct benefit to us is it to have the doctor treat such ailments as colds, indigestion, headache, cramps, sore throat, boils and all the other ailments in the list. We answer for the very same reason that it pays us to prevent infection resulting from injury. For the reason that if a man is valuable to have in our employ, he is more valuable if he is in a good physical condition. If an employee has a headache or cramps, it is more profitable to have him treated at our own plant, relieved of his suffering, and sent back to work within an hour, than it is to have him lose a whole day. Then, too, the work our doctor does in the way of preventing illness among our employees by prescribing when the first symptoms are evident, cannot be over-emphasized. Dozens of cases of this kind have been brought to our attention. The men are more and more taking the doctor into their confidence, and he is teaching them, in many ways, how to live better physically.

"Now the question is asked: 'After all, does it pay?' Our own experience answers emphatically in the affirmative. Welfare work is far-reaching. It includes something more than merely business success, for it affects the moral and material welfare of any community. We may rightly emphasize the good business of any such policy; but after all there is an element of sentiment interwoven through all the industrial fabric, the absence of which would be seriously felt. A business policy that absolutely ignores all feeling of sentiment is not desirable. There are contributory causes for business success, and they are fostered by a system of management which recognizes in every one of us a closer tie than that which can be measured by any pecuniary relationship. The dollar does purchase perfunctory service, but it cannot and never will secure of itself loyalty and goodwill."

Calorimetric Determination of Fatigue of Metals

In a recent report C. E. Stromeyer, chief engineer of the Manchester Steam Users' Association, England, deals with a new method of testing the fatigue of metals. It is carried out by calorimetric determinations, based on the consideration that there is practically no internal friction in perfectly elastic materials such as steel.

A tuning fork will continue to vibrate in a vacuum for a long time, whereas with tuning forks of brass or cast iron, materials slightly plastic, internal work is done and the vibrations soon die out, because the repeated strainings are associated with what may be called molecular friction. This friction will also occur in steel and other elastic materials if the stresses to which they are subjected exceed their elastic limits; and as mechanical friction is converted into heat it seemed probable that if a test piece were subjected to fatigue stresses and provision were made for measuring any heat which might be generated, then it would be found that up to a certain limit, up to which the material was perfectly elastic, no heat would be generated, but that if that limit were exceeded the resultant internal friction would produce heat which might possibly be detected by sensitive galvanometers, and thus the limiting stress, or fatigue limit, would be found.

The method used was to surround the test piece with a loosely fitting sleeve of thick india rubber, to pass a small stream of water along the annular space between the test piece and this tube, and to measure the difference of temperature between the inlet and outflow. When a difference of about 0.01 deg. C. was noticed the fatigue limit was supposed to have been reached, but the fatigue stresses were slightly increased to confirm this indication. The difference of temperature between inlet and outflow would now be considerable, but would generally disappear again if the alternating stresses were reduced below the limit. The calorimetrically determined fatigue limits were generally very clearly defined, and may be depended upon as being nearly correct. Further, they agree remarkably well with the fatigue limits found by extrapolation of series of tests carried to the point of fracture.

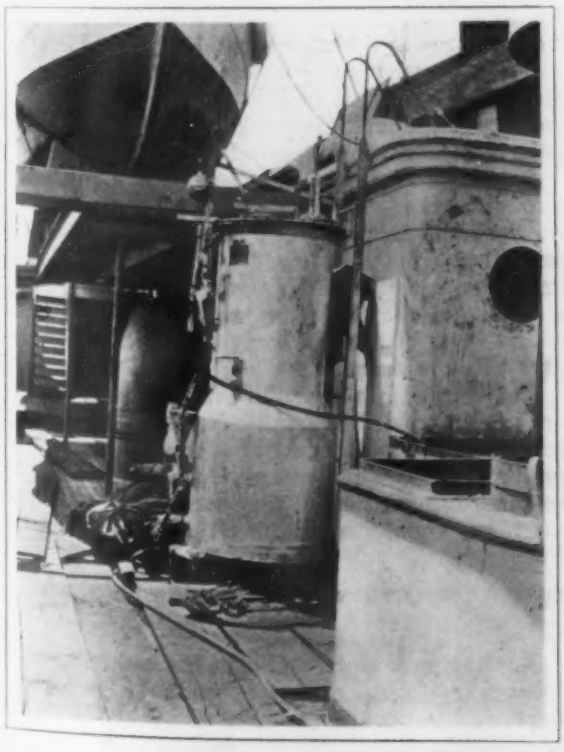
Mr Stromeyer considers that, by this new process, fatigue testing has been placed on the same practical footing as tensile, torsion, bending and impact testing. It seems to possess the great advantage that the fatigue limits are determined with great certainty as well as that the fatigue-testing process has been greatly shortened. Such a test can be carried through in one to two hours, whereas the process involving the fracture of half a dozen test pieces requires many hours.

REMOVAL OF SHIP'S BOILERS

Use Made of the Oxy-Acetylene Torch to Overcome Small Size of Hatchway

While the United States revenue cutter Seminole was undergoing repairs at Arundel Cove, Md., recently, two large boilers were cut out of the hold by the oxy-acetylene torch. This work involved about 1000 ft. of cut in plate averaging 1 in. in thickness, and the acetylene was supplied by a generator of 50-lb. capacity, made by the Alexander Milburn Company, Baltimore, Md.

The boilers removed were of the Scotch marine type and comprised the complete original battery placed when the ship was built and before the deck was laid. In overhauling the vessel, new Babcock & Wilcox boilers were installed, and on account of the small size of the boiler hatch, which did not provide enough clearance for the removal of the old boilers without dismantling, the oxy-acetylene cutting process was employed to reduce them to sections that could be readily handled. Each of the boilers was approximately 13 ft. in diameter and 9½ ft. deep from front to rear. The shell was made of 1¼-in. steel and the heads were 15/16-in. metal, while ⅝-in. plate was used for the back connection of the furnace section. Cuts were made on each of the boilers as shown in the accompanying sketch, and the top was first removed by making a cut around the upper third of the circumference, front and back and then making five longitudinal cuts across the free section, front and back. The upper third of the front and back plates was then cut into three sections, each of which was lifted out complete without removing the stays. The middle or tube section was next cut into four parts after the shell had been removed at the sides. In dismantling this section, cuts had to be taken in the back connection plates corresponding to those in the front and rear heads. The boiler tubes were removed intact. The lower or furnace section was removed in three pieces, each being cut loose at the ends around



The Acetylene Generator Which Was Used, Installed on the Deck of the Vessel. The Gas Supplied Was Led Down the Hatchway Through a Hose

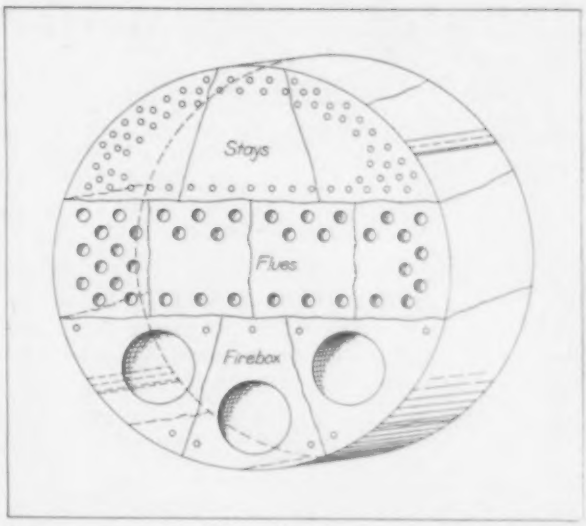


Diagram Showing the Cuts That Were Taken with an Oxy-Acetylene Torch on a Boiler Front to Enable It To Be Removed from the Hold of a Vessel. The Ragged Lines Indicate the Cuts

one of the furnaces, and the bottom section of the boiler shell was finally removed in four pieces. When the pieces of steel were cut free, they were hoisted through the hatch with the aid of a gin pole rigged on the deck and loaded on a scow alongside the cutter.

The removal of the boilers involved the cutting of a total of approximately 1000 ft. of plate, averaging 1 in. in thickness, with a maximum of 3¼ in. at points where there were butt joints in the boiler shell reinforced by 1-in. straps on both sides. A thick layer of paint on the entire outer surface of the boilers and a coating of scale on the interior added to the difficulty of cutting. The working quarters, which of necessity were rather cramped, were an additional handicap to the making of rapid progress. The total time occupied in cutting up and removing the boilers was 64 hr., divided into eight working days of equal length, but as approximately half the time was occupied in preparing for new cuts and clearing away the sections of the boilers, the actual cutting time probably approximated 30 hr.

The acetylene generator was located on the main deck beside the boiler hatch, as illustrated, and the steel oxygen supply cylinders were placed on the boiler deck convenient to the two iron workers detailed from the revenue cutter service depot to operate the cutting torches. Hose lines of sufficient length were provided to enable the operator to reach any point on the boilers.

Announcement is made that 500 business men, bankers, lawyers, economists and railroad officials will meet at Chicago, November 13 to discuss a number of railroad problems, including the plan just proposed by President Ripley of the Atchison for doing away with the Interstate Commerce Commission and establishing a regional group system with Governmental representation. Doubtless all of the merits and defects of the proposed new plan for regulating the railroads will be brought out at that meeting which will last for two days.

The Pennsylvania Railroad has built a steel cabin car at its Altoona shops for the use of freight train crews. This car, which constitutes the last link in the chain of all-steel equipment for this railroad, will be used on the different divisions experimentally to determine its fitness for freight service before work on others is started. The car contains bunks, lockers, a refrigerator, stove and lavatory, and will accommodate eight men.

Manufacturing with a Planning Department

Routing, Scheduling and Dispatching Work in Different General Classes of Manufacturing—The Example in the Franklin Automobile Works

BY GEORGE DE A. BABCOCK*

Productive effort in industrial processes will include the following requirements as indicated by orders and work. These are arranged from the lowest to the highest order in manufacturing efficiency:

a—One order for one piece, the piece never to be reproduced.
b—One order for several pieces never to be reproduced.
c—Repeat orders at irregular intervals for one or a few pieces.
d—Repeat orders at irregular intervals for many pieces.
e—Repeat orders at uniform intervals for one or a few pieces.
f—Repeat orders at uniform intervals for many pieces.
g—Continuous or standing orders for the same piece.

Any industry may have one or more in combination of these classes of effort.

In any analysis of the industry this should be considered, the industry classified into the above classes and a control plan devised in such a manner as will secure the best results for each class. A general control plan will then be devised to relate the classes.

WHEN PLANNING WORK IS JUSTIFIED

Costs are generally taken as an index of manufacturing efficiency, and by comparison, measures of such efficiency. Part costs are in general composed of labor and material plus certain indirect expenses as taxes, depreciations, assessments, etc. Labor cost is composed of two elements: rate paid labor and time taken.

An equation for cost may be expressed as:

$$C = (RT + M) + (nrt + nm) + A$$

in which

C = Cost.
R = Rate per hour of planning labor.
T = Hours of planning labor demanded.
M = Materials used by planning labor.
N = Number of pieces in each order.
R = Rate of operating labor per hour.
T = Hours of operating labor per piece.
M = Value of material in the piece.
A = All other expenses chargeable to the order..

This cost by the elimination of material and the value A can be expressed as: $C_1 = TR + nrt$. The similar cost when the work is done by special skilled labor may be expressed as $C_2 = nr_s\ t_s$, in which the terms have the same value as in the previous equation, except that r_s is the rate per hour of the special skilled labor and t_s is the time taken per piece (n) by that labor.

If $C_1 = C_2$ and the number of pieces n remain the same, n or the number of pieces which will cost the same in the two cases will be

$$n = \frac{TR}{r_s\ t_s - rt}$$

or it will equal the planning cost divided by the difference in unit labor cost. Assume as an example:

T = 8 hr.
R = 50 cents per hour.
r_s = 35 cents per hour.
r = 22 cents per hour.
t_s = 0.5 hr.
t = 9.1 hr.
Then $n = 8 \times 50 \div (35 \times 0.5 - 88 \times 0.1) = 26$.

*Production manager, H. H. Franklin Mfg. Company, Syracuse. This article is based on a paper read before the Efficiency Society, Lake Placid, N. Y., September 17.

For any more than 26 pieces, planning would be more economical than without planning. Less than this, planning would not be so economical. The above calculations assume that in a production of 26 pieces of this particular part, if we carefully plan so that untrained labor can perform its operating on the part, in a very short time the total cost will be exactly equal to the same accomplishment on the part but pereformed by a skilled workman who does his planning at his machine, and is assisted by indirect labor. The most difficult item to determine is the time t_s which will be required by the skilled workman to perform his operation on each part.

The equations will greatly assist the chief planner to determine how his work shall be distributed. Planning is usually applied and the cost distributed through indirect labor or overhead. This is due to the fact that the time elements of planning are very small and that no standard units for comparison are available. Few managers have any appreciation of these units, but endeavor to suppress all moneys paid for special planning labor in favor of allowing the untrained and probably inefficient workmen to perform it. In this case I mean inefficiency with reference to planning effort only.

Two classes of effort are usually required in performing work. They are mental and manual. The analysis of work into these two classes and its distribution to properly trained persons is the fundamental of planning management. If any work be subdivided into its smallest elements and these elements be grouped in order of manual requirement, it will usually be found that much of the work being performed by skilled manual labor can be as well, or perhaps better performed by indirect labor; in some cases in a higher mental scale, and in other cases in a lower mental scale. The labor supply of this country, and in fact of the world, contains a complete range from the highest to the lowest in the order of mental ability and of manual dexterity.

Since the labor cost of any work is the rate paid labor times the time taken, the combination of these two fundamentals must be carefully considered in estimating from an analysis. The second factor, time, is so usually the unknown and therefore such an uncertain one that managers are inclined to distribute their classes of work on the basis of rate only. This is unsound.

The world lacks woefully information as to unit times for standard efforts. Tremendous inefficiencies exist due to the fact that one manager after another must go to extraordinary costs in securing the same information. This does not in any sense enrich our industrial world, either through capital or labor.

ROUTING, SCHEDULING AND DESPATCHING BRIEFLY DEFINED

Routing is to learn and plan for each element of each part—form, material, method, precedence, quantity, time and place—as well as the relation of the elements to each other. Any part may contain any number of elements which may be similar or dissimilar in form or function.

Routing will decide for:

Form: the drawing or sample.
Material: the chemical composition, physical properties, dimensions or other specification.
Method: the machines, tools or fixtures and way of handling.
Precedence: the order in which work upon the elements shall be performed.
Quantity: the number of pieces in the unit lot advised by the schedule section.
Time: the duration of effort on each element of each lot of parts.
Place: department or department and machines.

The duties of the routing department will include the above determinations with other features that may be peculiar to a particular industry. In general it will specify all effort that may have a maximum influence upon these requirements. The appendix will show such duties as have been specified in this particular manufactory.

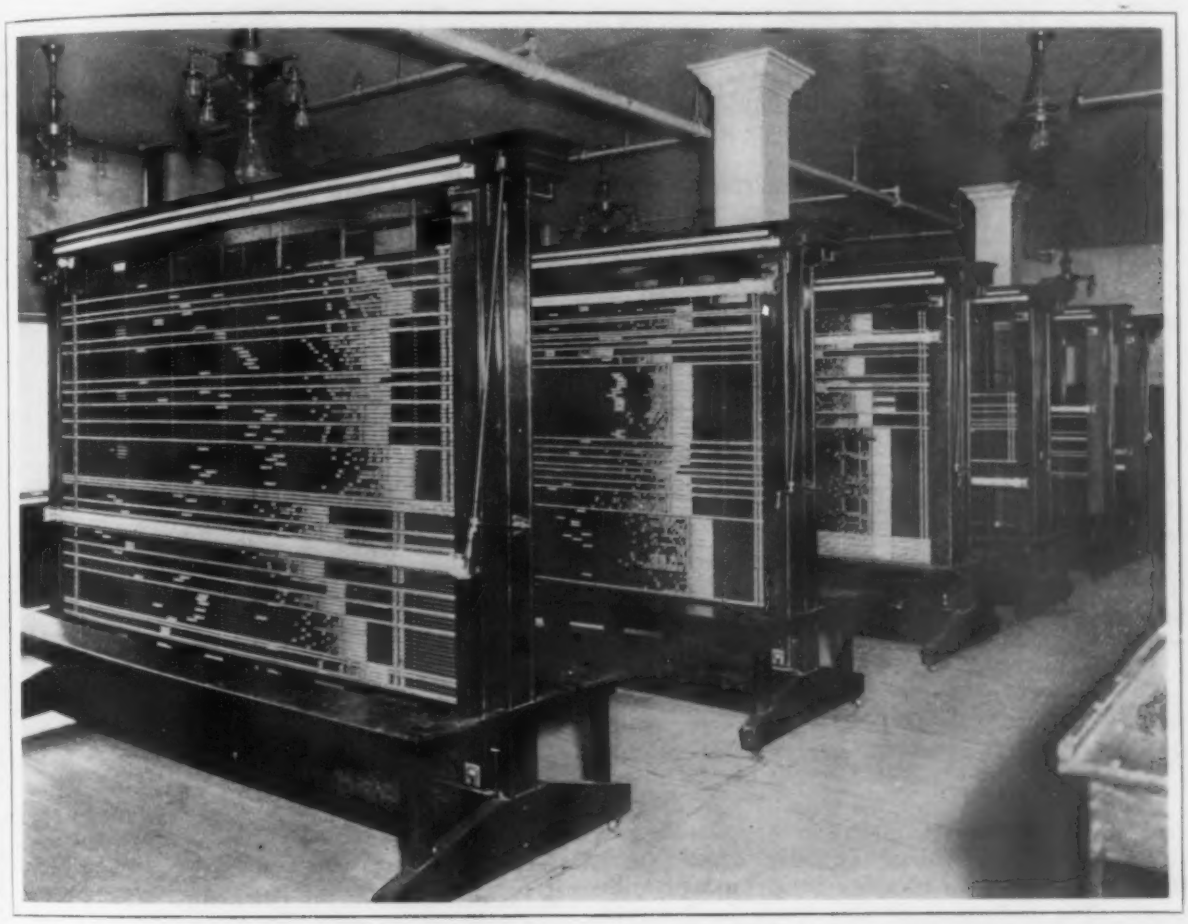
Scheduling is the determination of the rate, with respect to time and quantity, at which elements shall proceed. This section will translate the general orders of the management into detail orders for each element. It will perform the necessary clerical work and give such instructions as will be needed to accomplish its requirements.

Dispatching provides for the execution of the orders of the schedules section with methods provided by the routing section. In general, this section will deliver the detailed instructions of the schedule section with respect to each element, to the staff and line of the shops.

ROUTING FOR DIFFERENT CLASSES OF MANUFACTURING

The requirements with respect to routing of the classes of productive effort are for:

Class *a:* That a routing department compile instructions from data previously accumulated with respect to the least possible time element of the part, or that a workman whose training and experience has been sufficient, will plan at the machine for the element upon which he is operating or is to operate. Such a man must be highly skilled in manual operation, so that while performing on one element he can plan for the next. It is necessary that the man be manually skilled whether working



THE CONTROL BOARDS IN THE H. H. FRANKLIN MFG. COMPANY'S PLANT

To be able to purchase material so that it is ready at the logical time for machining or assembling or both and still maintain the most economical investment of capital; to be able to issue such as is machined to the shop at the proper time and in most economical lot sizes; to finish the parts in the shortest time consistent with good workmanship, and finally to deliver all parts to the assembly floor and insure the completion of the finished car, is with the H. H. Franklin Mfg. Company taken care of to a great extent by the Taylor system of scientific management and the control boards shown are used.

A motor car consists of, say, two parts: the vehicle and the power plant or engine in the vehicle. Taking the engine and carrying the process of division further, it will be seen that the engine consists of several groups of parts which may be called divisions; these divisions in turn comprise groups which may be called sections; the sections are combinations of still smaller groups which may be called subsections, and so on down to the individual pieces. To illustrate, the carburetor constitutes something which may be assembled complete and attached to the otherwise complete engine. The carburetor division may consist of three or four sections which together with individual parts are assembled and constitute the complete carburetor.

The boards themselves are large frames containing a great number of horizontal strips. Across the top of each frame is an adjustable scale. Sliding up and down the frame parallel with the strips is a cross piece, or runner, also having adjustable scales in it.

Each horizontal strip has fastened to it several blocks. A small number of the strips are white in color, while the majority are black. Each black strip represents one part required in a finished car, while each white strip represents an assembly of the parts on the black strips immediately above it. Each of these assemblies forms one of the sub-divisions, sections or divisions, previously mentioned.

Taking any one black strip, it is noted that there are several blocks attached to it at different intervals along its length. These blocks represent each operation of a finished piece from the time of purchase to the time of its completion ready for use in assembling the car. The longer blocks at the left hand side represent the requisition for the purchase of the material for the part, the smaller blocks along the strip represent each step in the process of the part and the long strips at the right hand end represent the finished part. The spacing of these blocks and the length of the blocks themselves, is to a predetermined scale, and bears a fixed relation to the top scale and sliding scales previously mentioned. By means of numbers on the blocks themselves and the values of these numbers as compared to the numbers immediately above them on the top scale, the information is given as to whether a part is behind or ahead of schedule.

with or without previous planning. A limited number of pieces will not allow the spoiling of one for the sake of experience.

Class *b:* The routing department will proceed as for *a* (one order for several pieces). In this case the reproduction after the first piece will require manual labor only. If the pieces are in sufficient quantity so that the operator will have a long period of manual labor, it will be impossible to take advantage of his mental ability efficiently on this particular work. The problem is how most efficiently to use the mental training of this man during the time he is operating.

Class *c:* The routing department will proceed as in *a*, or may secure their data from the accomplishment of a skilled workman. With the probability of the repetition of the order it is unwise, after the first order, to have a workman plan while accomplishing the manual labor.

Classes *d*, *e* and *f:* The routing department will provide for this time as in *c*.

Class *g:* The method of routing will be as before except that exact analysis will be so applied that the time of each element of a part will be exactly the same, and also that the machines and tools will be very highly developed.

SCHEDULE FOR THE DIFFERENT CLASSES

The scheduling will be accomplished as follows:

Class *a:* By estimate of the schedules department based on previous knowledge of similar parts. It may be based on a promise estimated by the workman from previous experience.

Class *b:* Will be similar to *a;* in addition, the time taken to prepare and finish the first piece can be used as an estimate of the time in which all the pieces should be finished.

Class *c:* The schedules after the first performance will be based upon this and succeeding performances; or, as before, may on estimate by the workman in conjunction with previous records.

Class *d:* Similar to *c*. The scheduling of classes *c* and *d* may be governed on a maximum-minimum basis, with orders emanating from the finished parts stock room. The frequency of orders depends upon the rate of depletion of stock to a standard minimum. The reduction of this stock is, however, caused by customers' orders, and the minimum may be reached at widely varying periods of time. The quantity which is usually ordered, if the stock is maintained at the lowest possible value, is that amount which is estimated to satisfy sales while a new lot is being manufactured.

There is no satisfactory way of scheduling irregular orders. It is desirable to systematize the manufacture even if it necessitates an extraordinary effort to secure a uniform demand in order to do so. It may be economy to manufacture uniformly (in limited quantities) without regard to demand, but upon anticipation, *i.e.* small lots manufactured at uniform intervals. Provision for unexpected demand would be made by extra orders at frequent intervals. With proper proportioning of regular orders such irregular orders could be reduced to a very small percentage of the total effort.

Classes *e* and *f:* By a type of control as mentioned in paper before the National Metal Trades Association by the writer under date of April 29, 1914, and published in *The Iron Age* essentially in full, beginning July 4, 1914.

Class *g:* Schedules under this plan will in general be set by the capacity of the equipment and the time of each element as determined by the routing division. This assumes the part to be manufactured continuously over the same operations. It requires the simplest type of scheduling but demands the highest type of routing. It is the most efficient type of manufacture, for by it practically all mental and manual work can be separated and still attain a large output for a given input.

ONE PRACTICAL APPLICATION OF THE RULES

An application of these suggestions is shown in the method of planning as used by the H. H. Franklin Mfg. Company to supervise the production of automobiles. Considerable reference was made to this plan in the writer's paper before the National Metal Trades Association.

At the beginning of this work a study of the plan of supervision developed the fact that the manufacture consisted almost entirely of classes *c* and *d*, i.e. "repeat orders at irregular intervals for one or a few pieces," and "repeat orders at irregular intervals for many pieces." This was considered undesirable for the extensive manufacture which was being done. It was caused by: 1—A variety of models and consequently of parts, in small quantities. 2—A schedule of shipments for finished product which was affected by the seasons and was thus irregular.

The quantity of production was sufficient to give economical returns under good shop practice and, in fact, the company was enjoying prosperity. It being their desire, however, to reduce the sale prices of the product to the lowest possible point an entire revamping of methods was considered. Briefly the following method was pursued:

The time taken to perform each operation on the part at each machine was determined by estimate or by actual practice. The operation times were then grouped by machines. A study of the grouping indicated too large a variety to be able to manufacture under class *g*, i.e continuous or standing orders for the same piece. This was due to the fact that the product is high in quality and requires a great amount of careful workmanship. The initial materials are costly. The lowest possible sale price is therefore larger than that for a cheap product and the demand is necessarily considerably less.

Through a simplification of models and a change in the deliveries of the finished product to our sales organization we were able to modify the effort and bring it in to next to the highest class of manufacturing effort, *f*, i.e. "Repeat orders at uniform intervals for many pieces" with a small proportion of the product under the class *g* "continuous or standing orders for the same piece." Since, however, there was but a relatively small amount of the latter class, or of the first or irregular classes, we decided to plan our main control for the one class only, that is *f*.

All irregular classes such as tool work, machine repair, manufacture of sundry parts, plant repair, etc., are segregated in a separate shop. Class *g* or continuous production is considered and controlled as for class *f*. All cases of class *e* are obviously controlled as for class *f*. I shall not discuss the control plan for irregular classes, since we have not completed this as yet in our works, and there are many excellent examples, such as the Link-Belt Company, Tabor Mfg. Company, Watertown Arsenal and others that have long been in operation.

THE PLAN IN DETAIL

The engineering division after consultation with the routing division furnishes the producing division with a complete set of assembly and part drawings of a given car. The drawings contain all information required by the producing division that

is indicated by form, material and arrangement. The general manager, sales and works manager determine on a given schedule consisting of the number of cars and types for each month for a certain period of time.

The schedules and drawings are furnished by the above on request of the producing division. The drawings are received by the chief schedules clerk, who records their receipt and submits them to the routing department. The routing department inspects the drawings, decides on the form of raw material to use, plans operations and prepares such other data and information as is shown by the requirements of their department.

The schedules section lays out the control board tape. From the operation sheets they erect and prepare the control board.

As soon as each part is erected a manufacturing order is written for it. The date tape on the board is used to determine dates for all events. The manufacturing order is indexed by the drawing number followed by a lot number. On a record sheet which is filed with the face copy of the manufacturing order, the schedules section enters the total quantity of each part which is detailed from the general manager's schedule. As each manufacturing order for a part is written, the quantity of the order is deducted from the total. As scrap and losses occur, or parts are diverted for various reasons they are added to this total, thus keeping a perpetual balance of "available to order." As one part schedule expires another is secured to replace it.

At the time of writing the manufacturing order, so also is written the stores issue, the lot move tag which accompanies the goods, and a move ticket to move the material into the shop. When the material is moved into the shop, a set of job cards are written and are posted to the machines in the despatch racks. The route of the part over the machine is shown on the control board. The first operation tickets are posted in a compartment "At the Machine." All other operation tickets are posted in a compartment "On the Floor in Process."

The despatch racks and planning boards have now been arranged in one office. The despatching of the individual jobs to the different machines in the factory is to be done by pneumatic tubes and the entire clerical organization is in one center. All moves are posted directly to the boards and no intermediate record is used.

CONCLUSION

It is very important that each manager should keep in mind the fact that forms are but the distribution of detailed instructions to particular persons for the solution of the manager's problems. These problems differ in practically every different industry and sections of the industry. It is not wise for a manager to consider the use of detailed forms which have been planned by another manager until it has been determined that the problems to which they are to be applied are identically the same. Above all things form or method must not be mistaken as essential, but rather that the manager's orders, no matter what they be, are exactly carried out.

A substation from which one of the machine shops is controlled. The boxes shown in this photograph contain the time cards which have been written for the workmen and these time cards represent both the work they are actually engaged on and the work which will come to them next. The substations are, in fact, clearing houses between the control boards and each machine where the work is done. The information as to when and how to do the work emanates from the control boards, and after the work is done the information to that effect is returned from the substation to the control boards.

Discussion by Robert T. Kent

Mr. Babcock's paper puts in a new light one feature which has always been a matter of more or less dispute between the advocates and opponents of scientific management. This is the question as to when it will pay to plan work in advance for the skilled workers. The opponents of scientific management take the ground that in the great majority of cases, particularly those cases where work is not repetitive, the time expended in and the cost of the planning room more than overbalance the economies effected by the planning. Mr. Babcock's reduction of the matter to a mathematical formula will permit anyone to ascertain when it will be economy to plan in advance and when money will be lost by so doing.

It is dangerous, however, for a shop which has started in to plan in advance the work of its employees to operate with work partly planned in the planning room and partly left to the initiative of

the workman. One of the most important functions of the planning room is the scheduling and routing of work. Were, say, one-half of the product of a factory to be planned and the balance unplanned because the number of identical pieces was below the number indicated as economical by the formula, the factory schedule would soon be in utter confusion. The time expended and cost of planning an individual item is the least important factor in the case. The principal object to be aimed at is the smooth running of the factory, and, so far as possible, uniform production.

Planned work can be counted on to pass through a certain operation at a predetermined time. This has influenced the general production of the factory in two directions: It makes certain that the part under consideration will arrive at an assembly point at the proper time for assembly into a group or completed product without delay either to itself or to other parts, the movements of all having been coordinated; it ensures that machines will be available at the time they are needed for regular product of the factory.

FAVORS PLANNING FOR ALL WORK

Considering the latter phase of the question, it is obvious that were an operation of the work not planned, but left to the initiative and judgment of the workman, the workman might easily keep the machine occupied, which, according to the schedule of the planning room, was required at that time for a job of far greater importance. Were the workman to continue in his occupancy of the machine, it would throw the schedule awry. On the other hand, were he to give place to the work scheduled for that machine, there would exist the possibility of his remaining idle until the machine was again vacant, or if he should be transferred to other work, the unplanning job might possibly be overlooked and delayed until it had caused trouble. In the writer's opinion, the only safe rule is to plan all the work or none of it. This opinion is confirmed by experience of several factories with which the writer is familiar and which had adopted the expedient of sending simpler jobs into process without preliminary planning. In every case it was found that work in the end proved more costly than if it had been planned in advance.

SEPARATE SHOP FOR SPECIAL WORK

One other feature of Mr. Babcock's paper which deserves special and serious consideration by manufacturers is the statement that all irregular classes such as tool work, machine repair, manufacture of sundry parts, etc., are segregated in a separate shop. No factory which makes a regular line of product manufactured either for stock or upon order, can afford to have its regular line of production broken into by special orders, no matter how important the customer may be. The injection of a special order into a regular manufacturing schedule, may easily work untold harm so far as keeping the regular stock product up to the minimum requirements of good commercial practice. By this I do not mean the order for special work which comes in and which is planned in advance and takes its place in the regular production schedule of the factory. Even though it is not in accordance with the regular line, a special order makes little or no disturbance to the factory schedule as all its variations from the regular product are known and planned for in advance.

It is the "must" order which comes, having been promised by the sales department to a favored customer on a certain date, and this without the consultation with the factory, that raises the disturbance. It means that the production manager must break up his schedule irrespective of the importance of lots in process, in order to release the machines needed for the execution of the special order. Such a disturbance of the regular schedule in certain lines of work may require two or three months to correct. It is difficult to estimate the dollars and cents damage thereby done. If the special work is of sufficiently great volume to form a valuable portion of the company's business, it should be, as recommended by Mr. Babcock, segregated in a separate factory. Even here it should be compelled to follow the regular routine of planning and scheduling before being put in process. As every job going through this separate factory would do so by the direct orders of the sales department, the production manager would be freed from a burden which he is to-day compelled to carry and which does not belong to him, namely, the responsibility of pushing through special order ahead of stock production, which is the regular business of the factory.

Reply by Mr. Babcock

I am not satisfied that my equation or mathematical statement will permit "any one" to ascertain the relative economy. It is more in the sense of suggestion as to the component factors which enter into the problem. I can appreciate that it will take a pretty good man to estimate the time t_s; *i.e.*, the time which skilled labor will require in which to do its work, but an approximation of this time can easily be considered and used to some extent.

In a careful reading of my paper it will be noticed that I do not advocate in any way the mixing of labor for which planning is done and for which planning is not done. I wish to give a typical illustration of what I mean by unplanned work: Both our wood and metal pattern makers do their work without planning and we charge no overhead whatever to their work. We do use the mental capacity of the workmen as the planning brains for their department. All other lines of work, like tool making, sundry parts manufacture, are made in a separate shop which will be planned for as mentioned.

Mr. Kent has made one wrong assumption where he says that "If one-half of the product of the factory was planned and the other unplanned it would be difficult to produce." It is not difficult at all to do job work and planned work at the same machine, if the planned work has the right of way. I am glad that Mr. Kent discussed the segregation of irregular work from regular manufacturing work, and I am satisfied that it is one of the biggest moves that a manufacturer can do if he is an extensive manufacturer.

The Colorado Fuel & Iron Company's report for the year ended June 30, 1914 shows that gross earnings in all departments were $17,803,025, and for the preceding year $24,315,887, making a decrease this year of $6,512,862. Of this decline $3,505,497 occurred in the steel and iron department and $3,007,364 in the coal branch of the company's operations. A deficit of $905,968 is recorded. The production in all branches shows a great decrease, coal output dropping 1,665,675 tons, pig iron 147,584 tons, finished iron and steel 105,592 tons and coke and iron ore approximtely 250,000 tons each. The reduced demand for steel and the coal strike share the responsibility for the bad showing made.

The Wellman-Seaver-Morgan Company, Cleveland, Ohio, has taken an order from the Cincinnati, Hamilton & Dayton Railroad for a car dumper to be erected at Toledo, Ohio. This will be a steam-driven plant and the contract includes a 500-hp. boiler.

COKE OF THE CUPOLA DUMP*

Using the Burned Coke in New Charge Owing to Low Sulphur Content

BY W. J. KEEP†

It is common practice among foundrymen to take the half-burned coke from the cupola drop and to let the man on the charging platform use it as he pleases without weighing. As it is water-soaked the weight would not be correct and as it has been weighed once, it should not again be charged against the cupola fuel consumption. It is desirable, of course, to charge no more iron and coke than is necessary to make the last iron good. At best, considerable iron will remain unmelted or will be cast in the pig bed. A corresponding amount of coke will be left over, but much of this fuel is burned by the sharp blast and hot cupola at the end of the heat. The best practice is to decrease the coke on the last three charges and frequently the last charge of iron can be melted without the addition of coke, the heat in the cupola walls being sufficient to melt the iron. The coke left over is not considered of much value and it certainly does not appear to have much fuel value.

BURNED COKE LOW IN SULPHUR

In the production of a certain grade of iron, it was found desirable to have the sulphur run as low as possible and the cars of coke containing exceptionally low sulphur were saved for that purpose. When we previously used Connellsville coke it was considered desirable to have the ash content about 10 per cent., so that the coke would satisfactorily carry the weight of the burden. Rarely was the sulphur less than 0.75 per cent., and frequently it was 1 per cent. or more. The by-product coke which we are now using has a firm structure and a low percentage of ash. One morning it occurred to me that the burned coke should be high in ash and low in sulphur and if so it should be charged on the bed. I took samples of by-product coke from the car from which the half-burned coke was taken and sent it to the producer to obtain the opinion of his chemist to ascertain the analyses of both the burned and the unburned coke.

He reported that the partially-burned coke is higher in ash than the average coke and for that reason would not be quite so good for melting iron. On the other hand, it is lower in sulphur than the unburned coke, and for this reason it would be more desirable for melting iron than fresh coke. Apparently the sulphur is imparted to the iron in a gaseous state and not from the molten or slag state. If the burning coke is not disturbed, the coke holds its original shape fairly well, retaining the ash as the carbon burns out, but in a cupola the chemist ventured the opinion that the burden and the movement downward would have a tendency to separate the ash somewhat from the coke during burning.

CHEMIST'S REPORT

The report of the chemist follows:—A sample of coke was obtained from the ovens containing 7.40 per cent. ash and 0.902 per cent. sulphur. Several pieces of this coke, about nutmeg size, were weighed, placed in a platinum dish and heated in a muffle about 1½ hr. Nearly two-thirds by weight of the coke was consumed, the volume remaining nearly the same and very little of the ash fell off while the coke burned, if it remained undisturbed. The unburned portion of the partly burned coke contained 8.86 per cent. ash and 0.706 per cent. sulphur. The ash from the burned coke contained 0.152 per cent. The weight of the pieces taken was 20.4419 g., the amount burned off was 13.2741 g., and the unburned coke left weighed 7.1673 g. The ash balance follows:

Ash Contents		
Ash in coke at start, g		1.5127
Ash in unburned coke, g	0.6351	
Ash actually burned part, g	0.8764	1.5115
Unaccounted for, g		0.0012
Sulphur Balance		
Sulphur in coke at start, g		0.1844
Sulphur in unburned coke, g	0.0506	
Sulphur in ash, g	0.0013	0.0519
Sulphur off in gas (by diff.), g		0.1325

0.1338 (0.1844 — 0.0506) of sulphur left the coke.
Of this 99.03 per cent. went off in gas while only 0.97 per cent. remained in the ash.

ANOTHER TEST

Another sample of coke was obtained containing ash 6.96 per cent., and sulphur 0.759 per cent. Several pieces of this coke were placed on a fireclay cylinder standing upright. The coke rested on a screen, being heated by a blast lamp burning full blast for 1½ hr. The results obtained were similar to those in the first test, although in this case some of the ash was disturbed in the coke by the blast. The unburned coke contained 9.12 per cent. ash and 0.686 per cent. sulphur. The ash from the burned coke contained 0.135 per cent. sulphur. Several other pieces of the coke were heated in the cylinder by a blast lamp for 2¼ hr. and in this case the unburned coke contained ash 9.72 per cent., and sulphur 0.657 per cent. This shows a still greater increase in the ash and a corresponding decrease in the sulphur.

From these tests it is apparent that when coke is only partially burned, the unburned portion is higher in ash and lower in sulphur than the original coke. The ash will not fall off while the coke burns if undisturbed. Only 1 per cent. of the sulphur in the coke remains in the ash, the rest passing off in gas. Whether any of this sulphur is absorbed by the iron, and if so what amount, can best be determined by work on a cupola in actual operation. However, if iron melted in a cupola increased in sulphur, it certainly must have taken it up from the coke, the limestone or from some other part of the charge.

The samples of coke received from the Michigan Stove Company analyzed as follows: Fresh coke—Moisture, 0.12 per cent.; volatile matter, 0.77 per cent.; fixed carbon, 91.43 per cent.; ash, 7.68 per cent., and sulphur, 0.582 per cent. Burned coke—Moisture, 0.15 per cent:; fixed carbon, 91.07 per cent.; ash, 8.78 per cent., and sulphur, 0.527 per cent.

Limestone nearly always contains some sulphur and this may have considerable bearing on the iron. The chemist ventured the opinion that it does so because much of the sulphur of the coke passes off in the gas, while the sulphur in the limestone would probably be partly at any rate, if not entirely, reduced to calcium sulphide, which, being non-volatile, would tend to come in contact with the molten iron and give up its sulphur to it.

The Lutz-Webster Engineering Company, Gray's Ferry road and Thirty-first street, Philadelphia, Pa., has just issued bulletin No. 4, giving data concerning its various compression tools. These have been found in practice to have many different applications, some not expected by the designers.

The Logan Light & Power Company, Logan, W. Va., has been incorporated with $1,500,000 capital stock by George W. Stevens, Jr., E. S. Aleshire and others, of Huntington, W. Va.

*Paper presented to the American Foundrymen's Association.

†Superintendent of the Michigan Stove Company, Detroit.

Organizing and Managing a Foundry

Rules That Help to Secure Maximum Results—Necessary Personnel—Duties of Executives—Correct Foundry Practice

BY P. R. RAMP*

The successful supervision of a foundry varies with its particular needs, but a close attention to details always repays. It is of vital importance that every man in charge of a portion of the work should know just what is expected of him and what he must expect of those under him. Especially must the responsibility for each detail of the work be placed upon the shoulders of some particular man who will be held accountable for it.

With this in mind the following shop organization is suggested, to be varied, of course, to suit local conditions:

SHOP ORGANIZATION

Works Manager:
In charge of all foremen and shop work.

General Foreman:
In charge of foundry, core room, chipping room, cupolas, pattern makers, carpenters, laborers and pattern storage. Will Act as Works Manager in his absence.

Assistant General Foreman:
Subject to General Foreman's orders.

Foreman Core Department:
In charge of core room, ovens, sand mixing, and everything pertaining to the production of cores. Subject to General Foreman's orders.

Foreman Chipping and Cleaning Department:
In charge of all chippers, and cleaners, sand blast operators, grinders, and anyone employed in his department. Will have charge of the shipment of all rough castings. Will be in charge of auto truck. Subject to General Foreman's orders.

Foreman of Laborers:
In charge of all laborers and helpers. Subject to General Foreman's orders.

Foreman of Pattern Storage:
In charge of all patterns and core boxes, and subject to General Foreman's orders.

Cupola Man:
In charge of all cupolas. Subject to General Foreman's orders.

Watchman and Engineers:
Will report to works manager when possible, otherwise, General Foreman.

The works manager is necessarily the connecting link between the foundry and the sales-office. His work embraces the entire activity of the plant, but the general foreman should have specific duties.

DUTIES OF THE GENERAL FOREMAN

Orders: Look over every new order, inspect the patterns and core boxes personally and decide how they are to be molded. Go over order sheets every morning carefully and catch every order that is not up to schedule.

Production: Lay out the work for the following day the evening of the previous day, early enough to have flasks provided and cores made. Give attention to special rigging for new jobs and also to standard work with a view to increasing the output.

Do a great deal of personal work among the molders and coremakers to stimulate an increased output. This is important. Have shipping department keep him informed daily regarding all back orders. Follow up cleaning department closely and prevent castings from lying around without being cleaned. Go over production sheet daily and keep the work going out according to schedule.

Good Castings: Melt the iron hot and pour the molds hot. Have pouring ladles skimmed. Inspect carefully sand, facing, cores, chaplets and flasks used. Do not trust any workman, but find out just how he is doing his work. Instruct him how his mold should be rammed, vented, gated, clamped and poured. Examine good and bad castings daily. This is very important.

Insist upon the approved and proven way of molding against any molder's individual preferences.

Bad Castings: Inspect daily all defective castings. Never allow a bad casting to go through without calling the molder's attention to it, also the core maker's. Bad castings are the most expensive things in a foundry.

Clean Castings: Look out for labor costs, rough castings, core rods and finns inside of castings, etc. A poorly chipped casting is the cause of much lost business.

Melting: Inspect daily charging floor. Plan to always re-melt the foundry scrap the day after it is produced, even if more pig iron is required to carry it. Check the melts and mixtures daily, as they are always going astray. Inspect the inside of the cupola daily and note by the lining how charging is being done. Watch blast gauge during the heat.

Core Room: Keep the sand mixture open at all times. For heavy work have cores well vented and well dried. Watch schedule closely and keep molds supplied with cores.

Inspect daily all new castings, good or bad.

New Business: Go over patterns carefully and decide the cheapest and safest way to do the work. Make all necessary rigging at once. Never allow a new job to drag, as upon good deliveries next to good castings depends the good will of every new customer. Use every effort to rush out new business.

Care of Patterns: No up-to-date foundryman should allow patterns and core boxes to lie around the shop. Keep them together stored in their proper places with core boxes, and in first-class repair.

Shipping: Review orders daily and confer with shipping department, especially regarding all reports of shortages.

Shipping department should watch back orders carefully and report them and insist upon the castings being furnished.

Always remember that a chaser indicates that the shop manager is not competent to keep the system working without outside help, which adds to the expense of manufacturing.

Memoranda: It is a good plan for the superintendent and foreman to make their own schedules. One similar to the following is suggested:

Inspect defective castings and confer with molder.
Inspect cupola and look over production sheet report.
Test iron made the day before.
Look over all new orders.
Follow up all new business.
Inspect castings reported clean and ready for shipment.
Confer with shipping clerk as to back orders.
Visit every molder's floor in the shop.
See if patterns have been checked up to date.
Inspect cores made in core room.
Visit cupola charging floor.
Arrange for the next day's work for molders.

*Works manager, the Quigley Furnace & Foundry Company, Springfield, Mass. A second article by the author will take up rules for cleanliness, accident prevention, etc.

DUTIES OF CORE-ROOM FOREMAN

See that all cores are properly rodded, vented, bedded, dried, pasted and blacked.

See that the cores required for the next day's work are listed and made before the molder is ready to use them. This is important.

Keep a detailed record of the work accomplished by each coremaker every day and turn it into the office the same evening.

Itemize on a printed form each day all material used in the core room.

Correct any defect found in a core after it has been taken out of the oven.

Keep a careful check on all cores required, and all cores made.

Arrange to have the larger cores delivered to a point where the molder can get them without too much labor.

Insist that the patternmaker or pattern department keep the core boxes in good shape.

Guard against the ill-usage of core boxes.

Patiently inquire into the cause of complaints from molders relative to poor cores, blow holes, etc.

Be sure that the sand is properly mixed and tempered, and that the right proportions of the different materials are used.

Report the shortage of any material in time to receive more.

Instruct a man to care for the fires in the ovens.

Keep the core-room in a neat and clean condition.

Be responsible for all work and actions of the men under him.

Assume the responsibility for the cost per ton of good castings in core work.

Return core boxes to the pattern storage or the customer, free from sand and dirt.

Lay out and order core arbors required.

Foundry Practice

Employees must be in the shop when the whistle blows.

The use of the small hand rammer must be forbidden, except where it is absolutely necessary.

Molders must mix their own facing sand. If they have a helper he may mix it under their direction; but they should be responsible for its quality.

The molder or machine operator should be required to take care of his tools, such as rammers, shovels, riddles, pails and buckets.

Each molder must make his own gaggers, except the dry sand molder, who will use wrought iron gaggers.

Every molder must skim for his partner.

He must also lift for his partner. If the lift requires a "four-up" the molder next to his partner, and the molder next to him who requires the lift, must help. If the lift requires a "six-up," the next molder each way must assist.

If the end of the shop is reached before enough men are secured by this method, the first man on the other side of the gangway nearest to the lift will assist. The foreman should instruct the molders who their partners are, and settle all disputes arising from any misunderstanding relative to lifting.

Every wood pattern not in the sand should be taken to the pattern platform at the end of the day's work. If the patterns are small the molder must take them himself; if large and heavy, the molder must see that they are moved. He will be at all times responsible for their removal.

Any molder desiring a load of new molding sand must secure the permission of the foreman or his assistant, who will instruct the shop cleaner to deliver it to his floor. The man whose duty it is to deliver this will report to the cost clerk at the close of the day the quantity of sand delivered. His report will be the number of "wheelbarrow loads." The foreman should furnish the cost clerk with the weight of a single wheelbarrow load.

When a larger quantity of sand than can be hauled in a wheelbarrow is required the foreman should notify the labor foreman to deliver it; and he in turn should report the quantity delivered to the cost clerk.

Every molder will be responsible for the tempering of his sand, if it has been cut over by the night man, he will be expected to inspect it before he uses it, and report any defect in the mixing. No excuse should be acceptable for bad work because some one else mixed the sand, because the molder must not use it if it is either too wet or too dry.

No excuse can be accepted because a bar is loose in a cope and causes it to drop out when the mold is closed. Molders must be made to inspect their flasks before using them, and report any defect.

The foreman should not allow molders to risk using defective flasks. This is important. It is the foreman's duty to see that all ladles of metal are skimmed while the molds are being poured.

Large pouring basins that create excessive foundry scrap should be forbidden, except where absolutely necessary.

Molders should churn heavy risers on heavy castings to prevent shrink holes. They should not be allowed to let such risers freeze up before the mold has received sufficient feeding.

Molders should be furnished rammers, with the standard size pean and butt. The handle should be made of 1-in. iron pipe. The foreman should specify the size of the pean and butt and see that they are made and used.

When several men require the services of the crane at the same time, the foreman must allow the men to wait, as that represents the least loss to the company.

No molder should be allowed to let his mold hang on the traveling crane while he is finishing it. Horses should be provided for him.

Any mold that can be handled by four men must not be lifted by the traveling crane, and the foreman must discourage this practice at all times. This does not apply to shaking out at night.

Small work in small flasks, such as is made on side floors, must not be poured off with the crane ladle, unless special provisions are made to make the practice successful.

Molders must not allow their flasks to burn after the molds have been poured.

The molder should not be excused for using poor cores and making bad castings. If the cores are either too hard, rough or too soft, or burned too much, or not properly vented, he must be held responsible.

In an opinion handed down October 29 in the Supreme Court of New Jersey, Justice Kalisch held that President Wilson's corporation laws of 1913, generally known as the Seven Sisters, prohibit the purchase of stock of a New Jersey corporation by a foreign corporation. This is a broader construction of the particular act in question than has heretofore been enunciated. If the view of Justice Kalisch is sustained it may develop that the Seven Sisters laws have been violated in numerous instances.

The Marion Steam Shovel Company, American Hoist & Derrick Company and Western Wheeled Scraper Company have combined to build a warehouse at 1933 First avenue, Seattle, Wash., where each will carry a much larger stock than in the past.

The Iron and Steel Institute at Birmingham

Seventh General Meeting Unique in Interest and in Its Revelation of Recent Developments in the Industry in Alabama

Iron and steel makers of the North have made many journeys to Birmingham, Ala. Time and again the enthusiastic men who have cast in their lot with that district have shown its rich veins of iron and coal to appreciative visitors. But the last week of October, 1914, brought the climax of 30 years of such inspections in the trip of the American Iron and Steel Institute to Birmingham to hold its seventh general meeting.

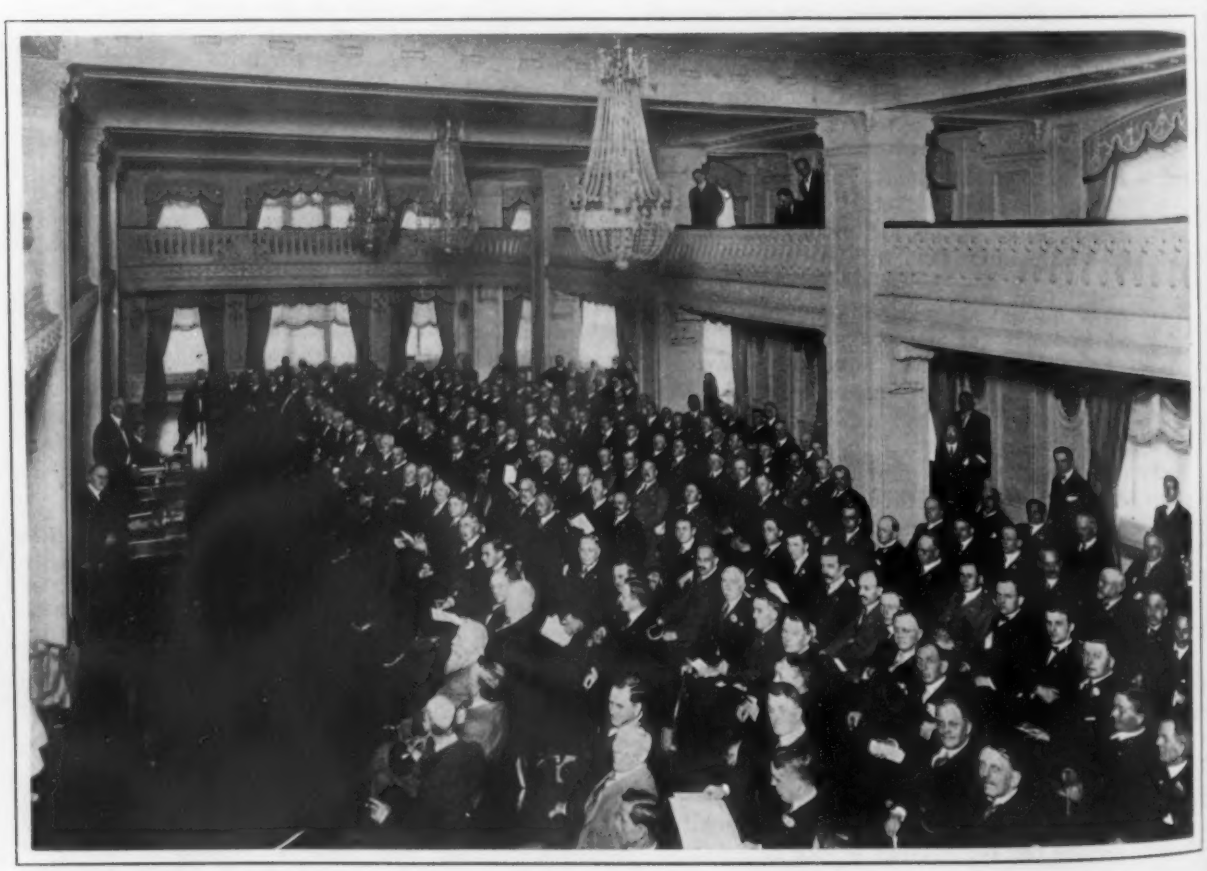
One could scarcely err in overstatement of the satisfactions the week brought to every member in attendance. To begin with, there was perfect weather. All of every day the sun shone and the temperature was in the sixties and seventies. The visitors were lodged at a hotel of metropolitan size and comforts. And leaving the first consideration until the last, throughout the three days they were in the hands of as accomplished and warmhearted a body of hosts as ever organized for the entertainment of such a gathering.

About 300 members were in attendance. But for the unusual distance and time involved, not to speak of the leanness of business, many more would have gone. A few of those present, including veterans like Joseph G. Butler, Jr., Capt. H. S. Chamberlain, S. T. Wellman and James Bowron, took part in the memorable Birmingham trip of 1890, when the British delegation, including Sir Isaac Lowthian Bell, was shown the resources of the district which was then looming up as the cheapest producer of pig iron in the world.

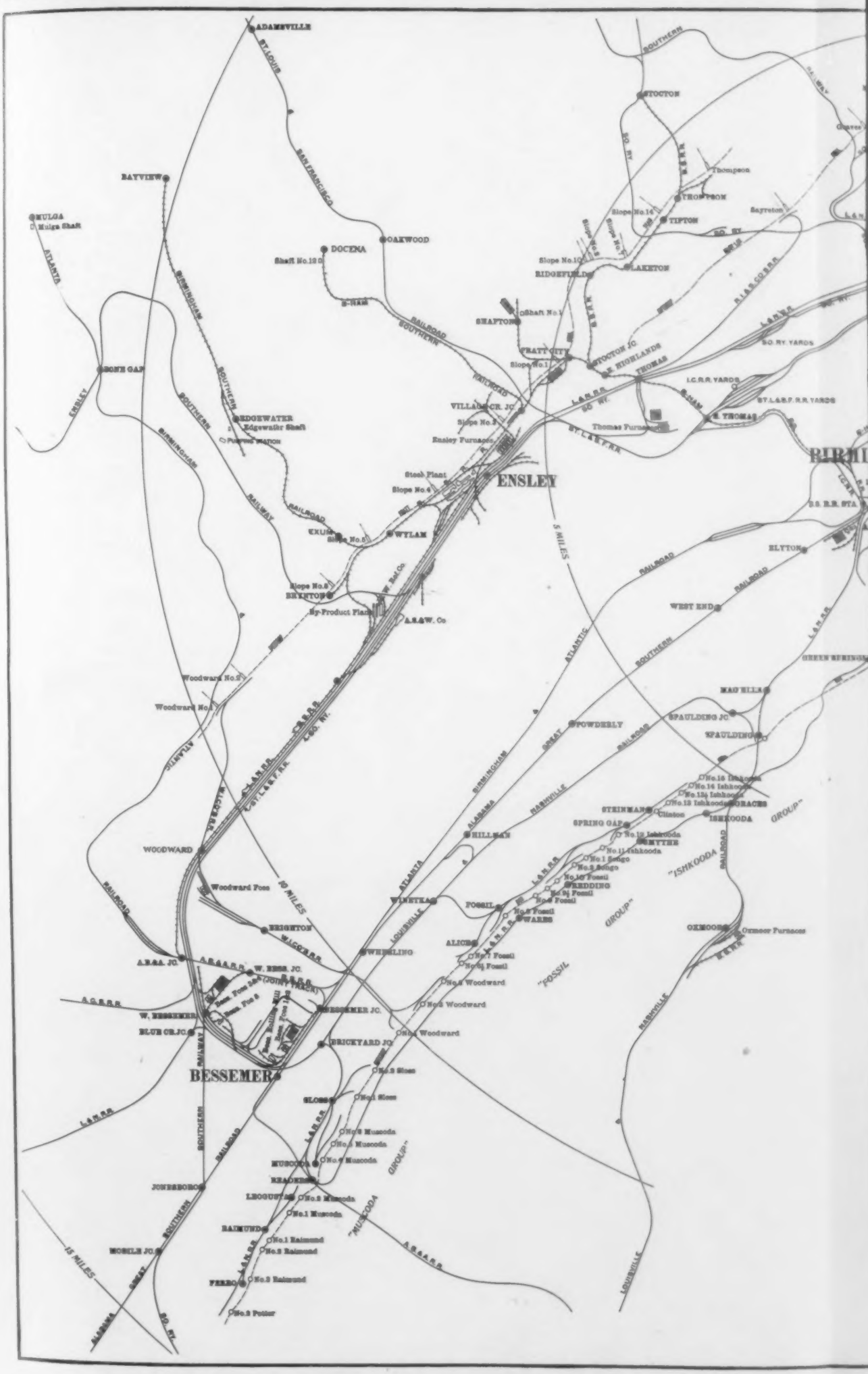
Some account follows of the two scheduled sessions of the Institute, of the dinner in the evening of the first day, of the two days of special train excursions to mines and works, and of social features that made notable and permanent additions to the number of Birmingham's warm partisans.

The address of Judge Gary was commented upon as one of the most noteworthy and arresting utterances he has ever made from the chair of the Institute.

Apart from the meeting and speaking, perhaps the strongest impression made upon the visitors was that made by Birmingham itself and the splendid development of the important properties in its environs since they fell into the hands of the Steel Corporation.



Seventh General Meeting of the American Iron and Steel Institute when Called to Order at Birmingham, October 29, by President Gary



Location of Mining, Blast Furnace and Steel Works Operations in

The excursion train of the American Iron and Steel Institute on Friday, October 30, went southwest of Birmingham, up Red Mountain to Ishkooda, down the mountain and westward to Woodward, thence to Bayview, in the northwest corner of the map, to the acre reservoir of the Tennessee Company; from Bayview, ret ing southward, to the American Steel & Wire Company's plan

ns in the Birmingham, Ala., District.

, to the 325-
iew, return-
y's plant at

Fairfield, which is south of Wylam; thence back to Birmingham. On Saturday a half-day excursion went directly west of Birmingham to the Thomas furnaces and then to Ensley.

Attendants at the Birmingham meeting went South in three main streams. A special train leaving New York at 3:34 p.m. on Tuesday, October 27, carried about 60 representatives of the East. It arrived in Birmingham Wednesday night. From Cleveland a special train went out on Wednesday morning, picking up the Pittsburgh contingent at Cincinnati and arriving at Birmingham Thursday morning. The Chicago party came in two special cars attached to a regular Illinois Central train.

The meeting was held at the Hotel Tutwiler, the latest metropolitan pride of Birmingham, representing an investment of over $1,500,000. Much of this outlay can scarcely be described as investment, for there is little expectation of profit aside from interest on $600,000 of bonds, for a good many years. Despite the low scale of operations in iron and steel, Birmingham had an air of activity, though it cropped out at the meeting that respecting the tariff and some other political issues sentiment has been changing there under the stress of tariff revision times.

Judge Gary opened the meeting in the banquet room of the Tutwiler at 10:30 on Thursday morning. His address, which is given elsewhere, was listened to with marked attention and there were strong expressions of approval as he developed his parallel between actual warfare and the destructive competition which American steel masters not long back had striven to replace with co-operation.

Papers and Discussions

The prepared programme of papers and discussions was carried out at the morning and afternoon sessions as indicated herewith, though with some deviations in the order of reading, beside the postponement of two of the papers to the evening session. Some of the papers were given in *The Iron Age* of October 29; others appear in this issue and still other excellent matter will be reproduced in one or two issues following. The list of papers was as below:

Forenoon Session, Thursday, October 29

The Use of Steam Turbines for Various Purposes, by Frank G. Cutler, chief of bureau of steam engineering, Tennessee Coal, Iron & Railroad Company, Birmingham, Ala.

Discussion by Leif Lee and Karl Nibecker, engineers Youngstown Sheet & Tube Company, Youngstown, Ohio.

Discussion by Alexander L. Hoerr, steam and hydraulic engineer, National Tube Company, McKeesport, Pa.

Discussion by Dr. L. C. Loewenstein, General Electric Company, West Lynn, Mass.

The Repair Department of a Modern Steel Plant, by John Hulst, chief mechanical engineer, Carnegie Steel Company, Pittsburgh.

Discussion by Bertram D. Quarrie, general superintendent Newburgh Works of American Steel & Wire Company, Cleveland.

Discussion by Howard L. Bodwell, assistant district manager American Sheet & Tin Plate Company, Vandergrift, Pa.

The Use of Titaniferous Ores in the Blast Furnace, by F. E. Bachman, blast furnace manager MacIntyre Iron Company, Port Henry, N. Y.

Discussion by Arthur H. Lee, superintendent blast furnaces, Lackawanna Steel Company, Buffalo.

Discussion by Richard H. Lee, superintendent Lebanon Furnaces, Pennsylvania Steel Company, Lebanon, Pa.

Thursday Afternoon Session

The History of the Iron and Steel Industry in the South, by James Bowron, president Gulf States Steel Company, Birmingham, Ala.

Discussion by Hiram S. Chamberlain, president Roane Iron Company, Chattanooga, Tenn.

The Modern Development of the Iron and Steel Industry in the South, by Thomas K. Glenn, president Atlanta Steel Company, Atlanta, Ga.

Discussion by George W. Connors, president Connors-Weyman Steel Company, Birmingham, Ala.

Discussion by M. P. Gentry Hillman, Carpenter & Hillman, Birmingham, Ala.

Southern Foundry Pig Iron, by James W. McQueen, vice-president Sloss-Sheffield Steel & Iron Company, Birmingham, Ala.

Discussion by L. R. Lemoine, president United States Cast Iron Pipe & Foundry Company, Burlington, N. J.

Discussion by Paschal Shook, president Birmingham Chamber of Commerce, Birmingham, Ala.

There is a growing feeling among members of the Institute that the meetings would be made more interesting by reducing the time allowance to writers of papers and discussions and making a more strenuous effort to secure impromptu discussions from the floor. The historical flavor given to the Birmingham meeting imposed a hard task on writers who dealt with history and were asked to condense; but there should be no attempts to give technical papers with any fullness from the platform. The listener is unable to follow the details of processes and results and is apt to lose interest under long continued reading.

The Banquet

The 300 participants in the dinner of Thursday evening quite well filled the Tutwiler ballroom. The paper of James Bowron and the discussion of it by Capt. H. S. Chamberlain had been carried over from the afternoon session. We shall print both in a later issue. Mr. Bowron won his audience promptly by striking out from the shoulder at some legislative aspects of the present depression, showing that he had stalwart thinking to match a stalwart frame and bearing. The diners were quite willing to have him go on, and the extracts from his paper on "The History of the Iron and Steel Industry in the South" were made so interesting that the allotted half-hour went to an hour with no one the wiser. Captain Chamberlain's personality also appealed strongly to the interest of his audience, and his reminiscent allusions to the struggles of the early blast furnace and rolling mill men of Tennessee were warmly received.

Informal Speaking

The Institute has fallen into the habit of "impromptu" speeches at its dinners. It was approaching 12 o'clock when the historical speakers had finished, and Judge Gary announced that nine persons who had been put on the impromptu list were yet to be heard. In turn he called upon L. E. Block, Edward M. Hagar, R. H. Edmonds, A. I. Findley, John A. Penton, Joseph G. Butler, Jr., James A. Farrell, Willis L. King, and George G. Crawford. Mr. Edmonds told of the heavy losses of population from the South after the war by emigration to other States, in explanation of the slow industrial development of that section. Mr. Penton urged that steel manufacturers repel the attacks that are being made from high quarters on leaders in the industry, believing that instead of holding their peace as they had been so prone to do they should resent some of the statements that had been unworthily made publicly against men in positions of leadership. Mr. Butler's remarks were in the vein which has become so well known and has caused his inclusion in every list of speakers at the Institute's dinners.

PRESIDENT FARRELL ON THE OUTLOOK

President Farrell of the Steel Corporation, whose prognosis as to business has well nigh become a feature of such gatherings, followed with an address covering, first, Birmingham's development and, second, the unparalleled conditions precipitated by the war. He said that few instances are known in which a city has increased in population from 38,000 to 133,000 in a decade, as Birmingham did in the decade 1900-1910, having now close to

(Continued on page 1105)

ELECTRICITY IN STEEL PLANTS*

Statistical Data on Its Application in the Industry in the United States

BY R. TSCHENTSCHER†

It is the belief of the writer that some statistical data, showing the magnitude of electrical application in the iron and steel industry, will be of interest. It is probable that a compilation showing such condition has as yet not been arranged. In collecting the necessary information, circular letters requesting certain data were sent to 85 companies engaged in the iron and steel industry. These represented approximately 200 plants. The companies addressed ranged from one plant to 33 plants under a central management. Replies were received from 62 companies, representing approximately 175 plants.

Of the 62 companies above indicated, 59 generate the electrical energy required, the remaining three purchasing their power. The following gives a résumé of the data submitted:

Number of companies reporting	62
Number of companies generating electric power	59
Number of plants generating electric power	170
Number of power generating units	840
Kw. capacity generating units	394,466
Installed motor horsepower	1,261,148
Number of motors in operation	45,512
Kw. load for illumination	33,863
Kw. load for metallurgical purposes	7,047
Kw. load for miscellaneous purposes	4,810
Kw.-hr. generated and purchased in 1913	1,641,564,000
Kw.-hr. generated in 1913	1,633,764,000
Average kw.-hr. generated in 1913, per company	27,700,000
Average kw.-hr. generated in 1913, per plant	9,610,000

The data obtained shows a power generating condition for 1913 varying from 100,000 kw.-hr. in the smallest plant to 330,000,000 kw.-hr. in the largest plant—electrically speaking. Three companies in 19 plants generated 683,000,000 kw.-hr., this representing almost 42 per cent. of the total generation. The electric power generation of the largest plant constituted 20 per cent. of the total, and that of the next largest plant over 8 per cent. of the total generation. Thus, the two largest plants, electrically, generated almost 30 per cent. of the total electric power of the 170 plants from which reports were obtained. These two plants represent no doubt the highest development of electrical application in the iron and steel industry, and illustrate the magnitude to which such application may attain as other newer plants are established, or the press of competition requires the existing older non-electrical iron and steel plants to substitute electrical drive for that now in existence, thus availing themselves of the economies incident thereto.

It is very probable that there are from 225 to 250 separate plants engaged in the manufacture of iron and steel in the United States. This does not include mining companies nor transportation companies. In arranging the foregoing data, information was requested to include the mining, making and handling of raw material, but not the transportation of the same, required in the iron and steel industry. However, the data obtained covered to but a negligible extent, figures relative to the mining, making and handling of the raw materials. The compilation may, therefore, safely be taken to represent the condition in the 62 plants engaged in the manufacture of iron and steel. It is very probable that if all of the plants addressed had been heard from, and including those which were not communicated with because of their location not having been known, that the total electric power generation for 1913 required in the manufacture of iron and steel was, approximately, 2,000,000,000 kw.-hr. and that on the basis of approximately 225 plants, the average generation per plant was 9,000,000 kw.-hr.

From the foregoing tabulated figures it may be of interest to attempt the deduction of the motor load factor. It is somewhat difficult to convert the total yearly kw-hr. generated into average kw. for the motor load. However, by deducting the lighting, metallurgical and miscellaneous loads from the total generation, and on the basis of an average operation of 6400 hr. per yr., there results an average power generation for motor load of 236,000 kw. On the basis of one motor horsepower, requiring one kw. at the switchboard, the average motor load factor in the iron and steel industry is approximately 20 per cent. A figure between 15 and 25 per cent. will, no doubt, represent the correct average condition. In one of the largest steel plants the average motor load factor is between 15 and 20 per cent., so that it is probable that between 15 and 25 per cent. represents the average condition in the iron and steel industry.

It is regretted that data showing the progress in electrical application, by five-year periods for the past 20 years, is not available. Approximately 25 years ago the first electrical application in the iron and steel industry was made. Progress was very slow, and the next 10 years saw the manifestation of but little interest. During the following five years, or up until 1904, some mills began to appreciate the economies of electric drive. The past 10 years has resulted in a most remarkable advancement. It is probably not far from the fact to state that electrical application in the iron and steel industry requires 20 times the electrical energy that was necessary 10 years ago. It is probable that no other single industry compares with the iron and steel industry in the rapidity of the advance of electrical application in the past 10 years. The indications are that the next 10 years will witness the elimination of practically all forms of drive other than electric. Metallurgical problems are being solved to a large extent by the utilization of electricity. A few years of prosperous commercial conditions will no doubt witness a remarkable advance in this direction. Such a realization will result in an electric power consumption compared with which existing conditions may be small indeed. Electric power generation by gas engines and large turbines presents economies which have sounded the doom to local mill steam engine roll drives.

The hearty co-operation of manufacturer and user has resulted in the production of reliable electrical equipment, both for generation and utilization. Operation costs of such equipment are far below that of any other type of equipment. Moreover, quality and quantity of output have been greatly improved by the application of electricity in the iron and steel industry. Lastly, electrical equipment is now so arranged that the resulting installations tend to the promotion of the greatest comfort and safety to the working force, requiring the minimum tax upon its vitality. Electrical engineers in the iron and steel industry may well, therefore, look into the future for a larger demand upon their capabilities and for the development of their initiative and capacity to the utmost.

*From a paper presented at the eighth annual convention of the Association of Iron and Steel Electrical Engineers, Cleveland, Ohio, September 14-19, 1914.

†Electrical superintendent and assistant engineer on construction, Illinois Steel Company.

MACHINERY TRADE COMPARISON

American and British Machinery Exports and Inter-Country Purchases

BY AN OCCASIONAL CONTRIBUTOR

In *The Iron Age* of June 4, 1914, an article was printed showing the relative position of the machinery industry in this country and in Great Britain. At that time, however, the detail figures relating to the calendar year 1913 had not been published by Great Britain, and the comparisons of exports then made referred mainly to the year 1912. The export totals for 1911, 1912 and 1913 given in that article were as follows:

Calendar years	United States	Great Britain
1911	$102,788,309	$154,803,390
1912	120,403,692	165,790,075
1913	127,980,880	185,137,910

It should be pointed out that although these figures are presented as the official totals of machinery exports they are to be regarded as only approximate when compared, because of the methods of classification adopted in each country being different.

BRITISH EXPORTS FOR 1913

In 1913 the exportation from Great Britain of the group of apparatus classified as "prime movers," including rail and road locomotives and engines for agricultural, pumping and mining purposes, amounted to $49,905,915, or an increase of about 21 per cent. compared with 1912. In this group notable increases took place in rail and road locomotives and agricultural engines, and for this class of machinery the most important markets were India, Argentina, Russia and South Africa. Decreases occurred in pumping and hoisting engines of 14 and 16 per cent. respectively. The "unenumerated" prime movers increased by 29 per cent. to a total of $22,532,930, and these engines were distributed mainly among India, Australia, Japan, Russia, France and Spain.

Electrical machinery of all kinds rose 15 per cent. to a total of $11,347,165, and went mainly to India, Australia, Japan, Russia, France and Spain. The exports of electrical machinery are analyzed somewhat extensively in both the United States and Great Britain and it is of interest to note that the American figures for 1913 amounted to $28,197,363, a rise of 21½ per cent. over 1912.

Another item of particular importance is the British exportation of steamship machinery, which, in 1913, amounted to $11,487,065. Its importance to the United States lies in the fact that of this total $136,750 worth came here—possibly as a result of the lowering of the tariff by the Underwood bill for the benefit of the American shipbuilding industry. The machinery representing the British total, however, was sent mainly to Holland, Australia, Norway, Russia, Spain and Japan.

Textile machinery still occupies the foremost place among the British exports as a single classification, and the 1913 figures show an important rise of over 17 per cent. as against 1912, or a total of $41,409,240. To this total the largest contributor was India, followed by Russia, Japan, Germany, France, Belgium, the United States and Canada. An important position is again taken by sewing machines, complete and in parts, but in 1913 the exportation of the complete machines decreased 44 per cent. as compared with 1912, or, to $1,047,345, while the sale of the parts of the machines rose by about 3½ per cent., or to $10,791,340. The machinery represented by these sums was sent mainly to Russia, France, Italy, India and Spain. A decrease is also recorded in connection with boilers, of which the exports were reduced by 5½ per cent. to $8,865,990.

Important increases occurred in machine tools, 8 per cent., or a total of $5,064,000, and in mining apparatus, 8 per cent. and $5,090,750. The latter item possesses some significance, as although South Africa is the premier market, as might perhaps be expected, the second in importance is Portuguese East Africa, tending to show that mining operations are being increased in Rhodesia and Manicaland—two countries for which mining prosperity has been frequently predicted. Among classifications of less importance the figures relating to typewriters—complete and in parts—are noteworthy to the United States in that they show an increase of 18 per cent., or a total of $191,470.

The remainder of the British exports is accounted for by the great "unenumerated" which reached a total of $43,208,800—6½ per cent. more than in 1912. This total was contributed to mainly by Argentina, Brazil, Italy, Japan, Egypt and Cuba, and, in the British empire, by India, South Africa, Australia and Canada.

BRITISH IMPORTS

The imports of machinery into the United States and Great Britain were, as stated in the article of June 4, as follows:

Calendar years	United States	Great Britain
1911	$7,495,921	$28,843,310
1912	7,610,511	34,103,415
1913	6,025,671	36,410,230

The figures relating to the imports into Great Britain for 1913 show again what an important market that country affords for the United States, as in nearly every instance America is the principal source from which Great Britain derives her foreign supply of machinery, and, indeed, it may be said that the only other competitor in this respect is Germany. In rail locomotives Germany supplied $11,295 worth out of $14,915 total imports; and in electrical machinery she supplied $3,605,390 worth out of $6,730,000, as against $2,189,530 worth obtained from the United States; but in pumping engines, agricultural implements, machine tools, mining machinery, sewing machines (complete and in parts), textile machinery, typewriters, and other mechanical manufactures, the United States has attained a strong position as the most important supplier of the requirements of Great Britain. Thus, of $177,705 worth of pumping engines imported, $92,205 worth was obtained from the United States, while other figures are: Of agricultural machinery, $3,841,600 total imports, $2,686,055 worth was supplied by the United States; machine tools, total $1,807,200, United States $1,624,160; mining machinery, total $572,390, United States $485,745; sewing machines and parts, total $2,063,170, United States $1,453,310; textile machinery, total $1,832,340, United States $720,665; and typewriters, total $2,562,850, United States $2,413,175. Of the "unenumerated" machinery, purchased by the United Kingdom to the extent of $15,398,980, Germany supplied to the value of $6,390,195, as against $6,292,725 worth sold by the United States.

Steps are being taken to form an auxiliary body of the Chamber of Commerce of Canton, Ohio, to be composed of manufacturers, jobbers, and bankers. A committee has been appointed to make plans, among the members being H. R. Jones, United Steel Company; H. H. Timken, Timken Roller Bearing Company, and P. L. McLain, J. H. McLain Company.

THE STEEL CORPORATION SUIT

Conclusion of Arguments Before the Circuit Court at Philadelphia

Oral argument before the United States Circuit Court of Appeals, Philadelphia, in the suit by the Government for the dissolution of the United States Steel Corporation was concluded on Thursday, October 29, and the judges have taken the case under advisement. Lawyers do not look for a decision by this court until next spring or early summer. Whatever the decision may be, it is expected that an appeal will be made to the Supreme Court and that another year or more may pass before a final decree. The judges sitting in the Circuit Court in the hearing of this case are Buffington, McPherson, Hunt and Woolley.

In the last issue of *The Iron Age* the report of the proceedings before this court were brought down to Monday, October 26. On that day Henry E. Colton, of counsel for the Government, discussed the export trade and claimed that it was outrageous that domestic consumers were forced to pay more for steel than the prices at which foreign consumers could buy steel from this country. He said that prices here should be reduced rather than that manufacturers should sell their surplus abroad at a lower rate. Judge Buffington asked whether he meant that manufacturers should reduce prices here despite the fact that the demand here is not great enough to absorb the supply. Mr. Colton answered that this was his meaning, as the lower price would create a demand. He defended the accuracy of the quotations on iron and steel products published by the trade papers, stating that many witnesses had testified that they made contracts based on these quotations. The same day David A. Reed, of counsel for the defense, complying with the direct request of the court, gave an elementary description of the processes used in the manufacture of steel. This was because he had protested against the Government's contention that a steel company's ingot capacity is the correct measure of its proportion of the steel business, claiming that he had never heard of selling ingots as such. He contended that a company's standing in the trade should be determined by the percentage of the country's capacity it controls in each product it sells. He stated that the Steel Corporation's percentage of the country's production has decreased steadily since 1901, while that controlled in each line by independent steel companies has increased greatly. He said that the Steel Corporation now manufactures but 40.9 per cent. of the iron and steel products consumed in this country. On the following day, with charts for a basis, he attacked the testimony of Prof. Jeremiah W. Jenks, who had asserted that the purchasing power of steel products in terms of other commodities has decreased constantly since the organization of the corporation. These charts showed that the prices of steel reached the peak in 1899 as to purchasing power of steel in terms of other commodities and since then have never been so high.

On October 27 much time was taken by A. Wellwood Murray, counsel for both the senior and junior John D. Rockefeller, and Frederick Kellogg and Chester Cuthell, counsel for the Great Northern Ore interests, who attacked the position of the Government that, in view of the cancellation of the Great Northern Ore contract, it did not expect punishment inflicted on the Great Northern interests except to make them pay costs.

On the same day Cordenio A. Severance, of counsel for the defense, argued against the Government's contention that the Steel Corporation controls prices and dominates its competitors. He gave numerous instances of price movements which had arisen as the result of action by independent companies. Referring to the Steel Corporation's ownership of transportation facilities, he said that its ore roads are as much an advantage to its competitors as to the Steel Corporation itself, and quoted numerous decisions to prove that the ownership of these roads is entirely legal.

On October 28 John G. Johnson, of counsel for the defense, condemned the Government's brief, flatly declaring it was based merely on scattered portions of the record and as such was an imperfect statement of fact. The prosecution should have endeavored to prove restraint of trade, but it had only insinuated that the existence of pools constitutes such restraint. He said that pools show the existence of competition, as otherwise a company exercising a monopoly would issue commands and not enter into pools. He referred to the opinion of Justice Sanborn in the International Harvester dissolution suit, saying that this opinion stated that the Sherman act does not provide for relief in equity from a corporation for something which at the time the complaint is filed it has lost the power to do. In describing the growth of the Steel Corporation, he said that it had never bought properties which were not offered to it. Taking a glance at the future, he said that if the corporation were to be dissolved into small fragments a peculiar state of affairs would follow the termination of the great European war. There would then be a resumption of industrial activity in the belligerent countries and United States manufacturers would again meet severe competition in the sale of steel products abroad. Their keenest competitor will be Germany, which country permits and believes in the existence of large and powerful combinations in industry. Opposed to Germany's large combines would be "these little miserable companies" of ours. He said: "Where will our export trade be then?"

Mr. Johnson made his plea one for corporations generally, being a protest of big business against the manner in which it is sought in this case to interpret the provisions of the Sherman anti-trust law. Attacking Mr. Colton's suggestion that the corporation, instead of selling its surplus abroad, should lower its prices to domestic purchasers and thus create an increase in the consumption, he carried this to a reductio ad absurdum. He said that the lowering of prices to dispose of the surplus would have made buyers overstock still more until a certain limit was reached and yet further sales would have been necessary. He said: "Then the only thing which the corporation could have hoped for would have been that the Government would send out one of these bright young men to develop a plan for making steel edible. Making the product attractive with a well-seasoned sauce, a demand could have been artificially created and the steel industry in America saved." Referring to the acquisition of the Tennessee Coal, Iron & Railroad Company in 1907, he said that the evidence produced by the defense had conclusively shown that this was a patriotic act and not done to gain a monopoly in the steel industry. He defended the supposed uniform prices of the Steel Corporation, stating that while this did not indicate that the corporation maintained excessive prices it was good business to make a good article and charge a fair price.

There was some discussion between opposing counsel regarding the reports of Herbert Knox Smith and James R. Garfield, former commissioners of the Bureau of Corporations, but Judge McPherson interrupted the discussion to say that the case would not be decided upon the opinion either of Mr. Smith or Mr. Garfield.

Jacob M. Dickinson, attorney for the Government, who followed Mr. Johnson, closed the argument in the case. He began by stating that no one admired more than he did the men who had the genius to build up great industries. He would be the last one to stand in the way of business expansion, but, he added, when the Government was confronted with the fact that in that expansion the law was being violated it was the duty of the Government to take notice of that fact. In answer to questions by Judges McPherson and Hunt as to the Government's contention regarding the formation of the Steel Corporation, Mr. Dickinson said it was the Government's claim that if all acts subsequent to the organization of the concern were disregarded the combination still would be illegal because it was created in violation of law, in that it was formed to restrain trade unduly. In criticizing the statement of the case prepared by the defense, he characterized it as "a pitiful failure." On the following day he made an extended argument in support of charges that the corporation was formed with monopolistic intent and that it actually exercised the power of a monopoly in that it suppressed competition and controlled prices. He

said that the corporation had the power to crush out competitors if it so desired, but it realized that if it pursued that policy it would be swiftly crushed by the Government. He said that the corporation had adopted the most astute and most comprehensive policy that had ever characterized any business movement in the history of the world by means of which its prices were kept up and large returns were received on its enormous watered capital.

ORE RATES TO LOADING DOCKS

Final Hearing in Lake Superior Ore Cases Soon to Be Held

WASHINGTON, D. C., November 2, 1914.—The Interstate Commerce Commission has fixed November 16 as the date for the final hearing in one of the most important groups of cases it has been called upon to decide. The direct issue is the right of the commission to make a comprehensive revision of the rates charged for hauling ore from the principal ranges in the Lake Superior region to the shipping docks. The matter has been pending for three years and it is now semi-officially announced that a decision is to be made in time to permit the framing of a new schedule of rates before the opening of navigation next spring.

ORIGIN OF THE CASE

The controversy had its origin in the case of Leon E. Lum vs. the Great Northern Railway, the complaint in which, submitted in October, 1911, alleged that the latter had refused to publish a reasonable rate for the transportation of iron ore from Grand Rapids, Minn., to Allouez Bay, Superior, Wis. The defendant made a motion to dismiss the complaint, alleging, first, that the commission had no jurisdiction to require the railroad to publish a rate for the transportation of ore until it could be shown that ore was actually ready to be delivered to the road; second, that the complaint was filed for an ulterior purpose, and, third, that no actual shipper had complained of the existing rate.

The testimony developed the fact that the only rate at which ore could be shipped from Grand Rapids to Allouez was 8.1c. per 100 lb., minimum 50,000 lb., this being the regular class D rate provided by the Western classification. A commodity rate of 80c. per ton, or less than half the class rate, prevailed at that time from points in the territory in which Grand Rapids was situated to the Lake, but the defendant carrier refused to make the commodity rate applicable to Grand Rapids until ore should actually be offered for shipment. It was further shown that the complainant was one of a number of owners of ore lands and of lessees of ore lands in the vicinity of Grand Rapids who had spent about $50,000 in work preliminary to the opening of mines. Before incurring any further expenditure, however, the complainant and his associates desired to secure a published rate under which it would be practicable to ship ore.

The commission refused to dismiss the complaint and in its opinion laid down some important principles in the interpretation of the interstate commerce act; one of the most important of which was the declaration that any citizen, before undertaking an industrial enterprise of any kind, has the right to secure from the railroads serving the point at which he proposes to locate a published rate on his proposed product, which rate shall prevail for the statutory period of two years. Replying to the contention of the defendant that the complainant could not possibly ship ore within the two years of the effective period of an order of the commission, it was held that this was not a material point and, if the railroad company should refuse to continue a published rate for a period longer than two years, it would become "the plain duty of the commission to institute a new investigation at the proper time and prescribe a rate which shall be just and reasonable under the circumstances and conditions prevailing at such time."

At the time this case was brought before the commission various rates were in force for the transportation of ore in the Lake region, the rates to the Lake from Mesaba points being 80c., from Tower 90c., and from the Ely group of mines in the Vermillion range $1 per ton. In November, 1911, after the refusal of the commission to dismiss the Lum case, the report of the Bureau of Corporations on the steel industry was given out, and thereupon the Steel Corporation's roads voluntarily reduced their rates to a uniform 60c. basis. This rate was also adopted by the Great Northern one month later.

SCOPE OF INVESTIGATION BROADENED

During the investigation of the Lum case the commissioners became convinced that the subject of freight rates on ore from the principal ranges to the Lake presented a question of magnitude and of high importance to the iron and steel industry, and that the issue should not be left to piecemeal determination on the basis of sporadic complaints. It was, therefore, decided to make an exhaustive investigation of the subject with a view to establishing a comprehensive schedule of reasonable rates. After this investigation was begun a number of the largest independent steel manufacturers were given leave to intervene and became parties to the proceeding. These included the Republic, Jones & Laughlin, Pittsburgh, Youngstown Sheet & Tube, Brier Hill, Andrews & Hitchcock, Ohio Iron & Steel, Cambria and other companies. When it was learned that the independent steel manufacturers had been permitted to become parties to the action, two additional ore-carrying roads, namely, the Northern Pacific and the Minneapolis, St. Paul & Sault Ste. Marie, which had interests in the Cuyuna range and which also maintained a 60c. rate to the Lake, were allowed to intervene.

At this juncture the Newport Mining Company, having mines in Ironwood and shipping to Ashland, Wis., over the Chicago & Northwestern, attacked the 40c. rate then in force for the 42-mile haul, and also complained of an additional charge of 5c. for "storage in cars at dockyards, unloading from cars to docks, storage in docks and loading from docks into vessels," all of which service, prior to January 1, 1913, was included in the hauling charge. Hearings were had in this case, but the issues finally became merged in the general investigation by the commission and which has not yet been decided. In the meantime, the complainant in the Lum case appears to have abandoned his enterprise and that case has not yet been finally determined.

Hearings in the case as initiated by the commission, to which the independent steel producers and the roads referred to are now parties, were begun at Duluth last December and were subsequently continued in Washington in May and September of this year. The last hearing will be held in this city November 16, when it is understood that important testimony will be submitted and the evidence closed. By an agreement reached with the commission, counsel for the independent steel manufacturers and the railroads will present their first briefs December 15 and their second briefs January 1, when the case will be argued. Both sides have indicated to the commission their desire to cooperate in every way in bringing about a speedy decision in order that all the ore miners, the ore-carrying roads and the iron and steel manufacturers may be able to begin their next season's work with a knowledge of the rates that are to prevail for the following two years.

W. L. C.

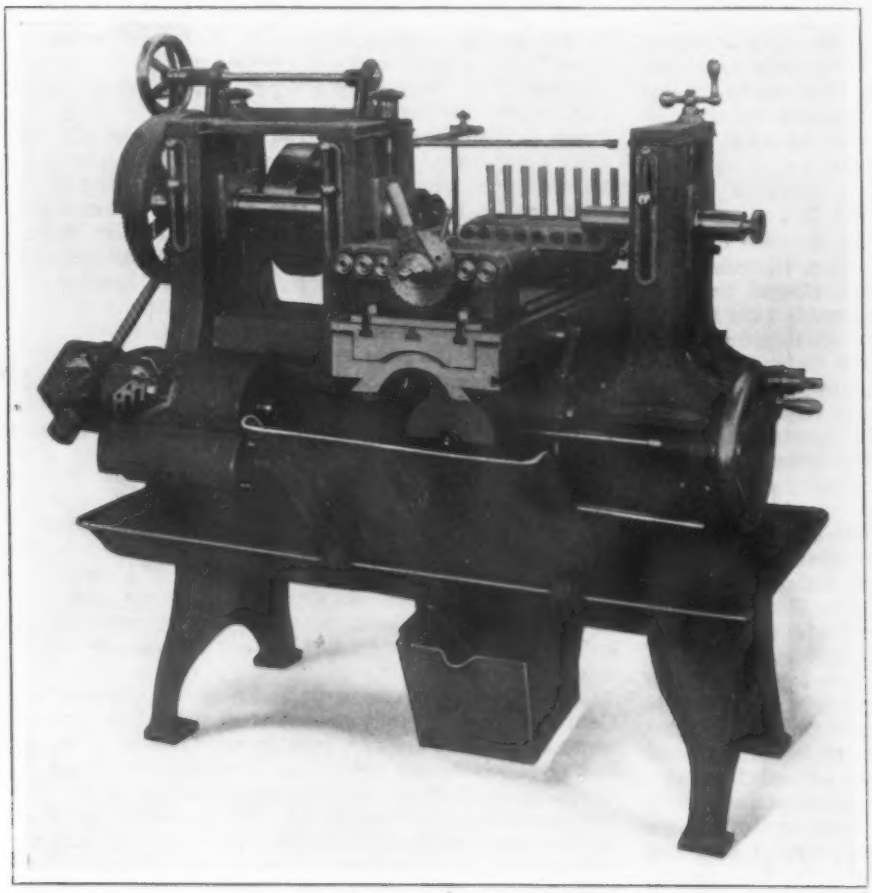
The exports of iron ore from Sweden in August amounted to only 210,540 metric tons as compared with 925,573 tons in August, 1913, a decrease of 715,033 tons or 77 per cent., according to Stahl und Eisen. In the first eight months of this year, Sweden exported 3,602,517 tons as against 4,209,181 tons to September 1, 1913.

The Icy-Hot Bottle Company, Cincinnati, Ohio, has recently received orders from London, England, for a total of 7500 Icy-Hot bottles. Considerable more business from the same source is under negotiation.

Machine for Milling Bridge Reamers

A recent product of the Hendey Machine Company, Torrington, Conn., is a milling machine that has been built especially for machining bridge reamers. It is equipped with a double or elevating table, and by the attachment of suitable cams, reamers having both initial and secondary tapers or with a taper start and a straight body, can be fluted continuously. As will be noticed from the illustration, eight spindle centers are used.

The table, which is made in two sections, has the upper one pivoted at the rear end, and is thus capable of motion between guides cast with the lower half or slide on the front. It is possible to bolt cams or forms to the side of the table, these engaging with a roller carried by a bracket bolted to the face of the saddle. Reliance is placed upon the form and application of these cams to enable



An Eight-Spindle Milling Machine for the Production of Bridge Reamers

reamers having initial or secondary tapers, or with a taper start and straight body to be fluted continuously.

The eight spindle centers which are mounted on the table index in unison and are designed especially for milling bridge reamers. The swing of these centers is 1½ in. and the spindles in the headstock are fitted with centers and coupling drivers, adapted for the tangs of taper shanks conforming to the Morse Nos. 2 and 3 standards. The feed index plate, which is of the ratchet type, is regularly drilled for 12 holes to provide 2, 3, 4, 6 and 12 divisions, but if desired, other rows of holes for different divisions can be supplied. Spring tension and lever release are provided for the footstock centers, and the binding plugs are operated by two handles, one on either side of the block.

In addition to the spindle centers illustrated, spring chuck equipment can also be supplied for centering and holding the ends of pinion shafts and similar work, which can be milled in unison. The maximum capacity of these chucks is ⅞ in. and a draw-in rod, two of which have to be operated by a key passed through a ratchet index plate, is relied upon to hold them in position. This type of headstock is fitted with special binding plugs, controlled by two levers, each one binding four spindles through two plugs and connecting compression block.

Farm Tractors in Heavier Demand

Considerable demand for farm tractors has sprung up throughout nearly the entire West north of Texas as a result of conditions growing out of the war, and builders of tractors are regarding the outlook in their industry most promising. The causes that are stimulating this demand include the sharp advance in the prices of horses, due to heavy exportation to Europe for war purposes, and the desire of the farmers in the great wheat-growing section to increase their output because of the good prices now prevailing and the expected heavy demand for export next year at high prices. To increase the output, wheat growers in the Northwest will have to cultivate more acres or engage in more intensive farming. In either case, it is stated, tractors can be advantageously used in place of horses. Another factor in the increased demand for tractors is the fact that Western farmers, having marketed their this season's wheat crop at good prices, have money to purchase equipment.

The tractor manufacturers have been turning their eyes toward Europe with the hope of getting orders for tractor equipment for use by the armies of the warring nations. At present motor trucks are used extensively in transporting supplies and various war munitions, but tractor builders may be able to induce some of the foreign governments to place orders for tractors for this purpose.

The Osborn Mfg. Company, Cleveland, Ohio, has just completed a three-story fireproof brick and concrete addition which will be used for its molding machine department and for making special machinery. The building includes a pattern shop, testing floor, office, and assembling and erecting department. This last department is located in a two-story bay which is served by a 17-ton electric traveling crane, having a 22-ft. span. The company is now building an addition to its New Durham, N. H., plant, of concrete and steel, which will be used for the manufacture and storage of enamel.

Receivers of the International Steam Pump Company have been directed by Judge Mayer of the United States District Court not to turn over or advance to the Janesville Iron Works Company funds to enable that company to pay its taxes and six months' interest on its 5 per cent. first mortgage bonds, which interest fall due November 1. The order is made in the suit of the Guaranty Trust Company against the International Steam Pump Company. The Janesville works have been turned over to other parties, and are not now in possession of the Steam Pump Company.

Water Wheel Trade in South America

J. V. Kunze, vice-president and general manager Pelton Water Wheel Company, 90 West street, New York, in commenting on the business which his company has done with South American countries in the past 25 years, remarked:

"Our business is peculiar, as there are relatively few individuals, firms or corporations who employ water power; consequently our clientele is widely scattered and it is practically out of the question to send traveling engineers to cover the field. We have spent considerable money in advertising and circularizing among planters, mining companies, electric light and power companies and various industries. We have found that where the material was well-designed and built, and gave the purchaser the results he expected, such purchase would really be an advertisement, as parties requiring similar machinery would inspect the plant, obtain the owner's experience as to its operation and results and would then insist upon having the same thing and made by the same company.

"It should be well understood by this time that any literature which is sent to Brazil should be in Portuguese and to the other South American countries in Spanish, and all correspondence should as far as possible be conducted in the language of the country.

"Competition in our particular line is principally with German and Swiss manufacturers, and we have been handicapped by the fact that they are willing to accept long-time credits, frequently 6, 12, and even 18 and 24 months. These extended credits, of course, carry interest ranging anywhere from 7 to 12 per cent. per annum and the interest is figured in on the invoice. The drafts, with bills of lading attached, are discounted by the European manufacturers at a much lower rate of interest than they obtain for the extended credit, consequently they have an additional profit in the transaction. The banks abroad discount such paper freely, so that the manufacturer's capital is not tied up. If American manufacturers were able to obtain similar discounting privileges, it would put us in a position to compete with European manufacturers on more nearly an equal basis.

"The principal requisites for the extension of our South American trade are adequate shipping and banking facilities and the ability to discount drafts attached to bills of lading at, say, 2, 4 and 6 months' sight. If such facilities could be obtained, also information through reliable banking houses as to the standing of individuals or firms desiring credit, our business could be materially increased."

Band Composed of Workmen's Children

Employers of labor are realizing more and more the importance of having contented employees. With this in view, many manufacturing plants have an expert in charge of welfare work, who devotes his entire time in looking after the interest of the workmen. A unique but successful plan in welfare work among employees has been inaugurated by the Portsmouth Steel Company, Portsmouth, Ohio. The company has in its employ many foreigners with large families, and numbers of the children are natural musicians. John Milliken, chief of the employment bureau, originated the idea of forming a juvenile band made up entirely of those whose parents are on the company's force. The band was organized June 16, with 22 pieces, and the members range from 10 to 16 years. The director selected for the band is Joseph Hladik, one of the company's carpenters, who succeeded in getting his pupils so well trained that in a few weeks the band was able to give a public concert, at which all the late popular airs were played. The programme for future concerts includes several classical selections. All the company's employees have taken much interest in the project, and the enthusiasm aroused among the workmen stamps the experiment as a success.

The Dyer Apparatus Company, oxy-acetylene welding and cutting apparatus, is now located in its new factory at 155 Brookline street, Cambridge, Mass.

San Francisco Exposition Pipe Welding

In the piping of the grounds of the Panama Pacific Exposition, 70,000 ft. of pipe has been laid. Up to a diameter of 4 in., the lengths of pipe are welded by the oxy-acetylene process, as they lie on the ground beside the trenches. From 4 in. to 16 in. in diameter, the pipe rests on timbers above the trench, and these are removed after the oxy-acetylene welding is completed. The 16-in. mains must be supported with block and chain while the staging is removed, and in one instance during progress of the work, for test purposes, an entire length of 16-in. pipe, weighing 1000 lb. was supported by its own weld.

Some 1200 Ft. of 4-In. Piping Welded into One Continuous Line and Dropped When Finished into the Trench

In another record case, due to ideal conditions and a sandy soil, it was possible to weld together 100 lengths of 8-in. pipe, each 40 ft. long. After the welding was completed the sand was shoveled from beneath to a depth of 30 in. and the long line gradually sank to its position.

Before trenching it, all welded pipe is subjected to a test with air of a pressure of 150 lb. to the square inch, and after gauge readings, showing the lines to be tight at the end of 24 hr., the usual soapy water is applied to each joint for further assurance of the absolute tightness of each joint. The 70,000 ft. of pipe was installed on the exposition grounds without, it is reported, a single leak.

A Welded 8-In. Cross

Book Reviews

The Cleaning of Blast Furnace Gases. By Frederick H. Wagner. Pages, 168, 6 x 9 in.; 58 illustrations and 6 charts. Published by the McGraw-Hill Book Company, New York City. Price $2.

This volume appears to be largely a continuation and extension of the author's discussion of W. A. Forbes's paper before the American Institute of Mining Engineers in October, 1913, defending the Feld washer. About one-fifth of the book is devoted to this washer and its comparison with other types. Of original data there are little of value to blast furnace operators. One chapter, however, contains some interesting information and curves on condensing and cooling conditions in mixtures of gases and vapors.

Insufficient space is given to dry dust catchers of the slow-speed type in the chapter devoted to primary cleanings, as these are still the principal ones in use in the United States. Centrifugal cleaners are rather fully illustrated, though the well-known Kennedy cleaner is not mentioned. The zigzag gas flue shown differs radically from those in use at South Chicago and Joliet. One-half of chapter 3, on secondary wet cleaners, is devoted to the Feld washer. Other washers are briefly described and illustrated and the types selected are typical. The list is fairly complete, although no mention is made of washers of the Steece type. English and metric units, it may be mentioned incidentally, are used indiscriminately. The drawings devoted to operating plants in America are only outlines.

Handbook of Construction Plant: Its Cost and Efficiency. By Richard T. Dana, consulting engineer, New York City. Pages, 702, 4½ x 7 in.; illustrations, 712. Published by Myron C. Clark Publishing Company, Chicago. Price $5.

Contractors and estimators will find much helpful information in this convenient handbook bound in flexible leather. The author has arranged in concise alphabetical order the results of a ripe experience with construction plants. The object of the work is to present indispensable information not previously published in ready, available shape for those buying, maintaining, and selling construction plants. Since efficiency of equipment is increasing much faster than that of labor, a thorough understanding of the economical phases is necessary. Expert knowledge of relative costs for different methods is essential for successful bidding against constantly growing competition. Free trade literature from equipment houses is abundant, followed by salesmen quoting high efficiency but who are mum on defects. The principal classes of machinery are listed with prices which as a rule are averages of several makes, and the advantages and weak points of each are explained for varying conditions. Records of performances are given which are actual—not theoretical or based on short-time periods with no allowance for breakdowns or the human factor, a species of deceptive advertising which the author calls cost analysis gone mad.

The main features of equipment are divided under four heads: cost, ready to commence work; capacity, minimum standard, and maximum; operating expense, including depreciation and repairs; and adaptability to conditions.

Beginning with air compressors, asbestos and asphalt plants, and closing with wagons, welding and wheelbarrows, the book contains practically every subject of interest to the general contractor.

The Railway Library for 1913. Compiled and edited by Slason Thompson. Pages 469, 5½ x 8½ in.; cloth. Published by R. R. Donnelly & Sons Company, Chicago. Price 50c.

The editor of this book, the fifth annual issue, is the director of the Bureau of Railway News and Statistics, Chicago. Its object is to present, in convenient and condensed form, selections from noteworthy addresses, reports and papers of the year relating to railroad matters. While the general rule restricts the selection to matter first made public in the year named, still the date of publication enables the inclusion of several articles of the current year. An important part of the book is devoted to a series of articles relating to the nationalization of railroads from the political, economic and historical viewpoints. Space is given to every important phase of railroad life as expressed in the utterances or reports of prominent railroad authorities and practical raiload men.

Chemical Analysis of Special Steels. By Dr. Charles M. Johnson. Second edition, rewritten. Pages 437, 6¼ x 9¼ in.; cloth. Illustrations 39. Published by John Wiley & Sons, Inc., New York. Price, $3 net.

Clearness, in a book of this character, is essential, and this has been decidedly achieved by the author, who is chief chemist of the Park Steel Works of the Crucible Steel Company of America. Special steels are constantly increasing in number and importance, and it is with rapid methods, both qualitative and quantitative, for analyzing these that the book especially deals. These are based on the author's practical experience, and the methods offered embrace the latest and best analytical practice in iron, steel and its alloys. The principal elements dealt with are chromium, tungsten, vanadium, titanium, molybdenum, nickel and cobalt, whether in the ore, ferroalloy or special steel. Besides a chapter devoted to the determination of nitrogen in steel, now considered by many metallurgists as a cause of defects, space is also given to the testing of lubricating oils and of coal and coke as well as the analysis of graphite and graphite crucibles. A short chapter is devoted even to the estimation of tin and bismuth in plain and alloy steels. Certain important kinds of apparatus are described and two chapters cover the annealing of steel and tests therefor, and annealing temperatures and the formation of decarbonized surface on steel.

An interesting generalization in the introduction states that: "If iron be combined by fusion with notable quantities of an element whose melting point is very much below that of iron, the tendency is to produce a metal of inferior physical properties, but if iron be combined with an element whose melting point is nearly that or higher than that of iron, then the tendency is to produce a metal of superior physical properties." This is illustrated by the author by concrete examples.

The author calls attention to several special features of the book, among which may be mentioned his method for titrating iron or vanadium, or both, in the presence of uranium; for the determination of uranium in ores, etc., and to complete methods for the analysis of cobalt steels and metals. A chapter is devoted to drawings and views of an extension to the laboratory of the Park works which gives valuable hints of what a modern laboratory should contain.

The book is comprehensive and valuable and will be found almost indispensable to the busy steel chemist and metallurgist. It contains 200 more pages than the former edition.

Examination of Lubricating Oils. By Thomas B. Stillman, late professor of engineering chemistry of the Stevens Institute of Technology. Pages 125; 6x9 in.; 116 figures. Published by The Chemical Publishing Company, Easton, Pa. Price $1.25.

This manual, by an experienced chemist, is a modern laboratory book on the testing of lubricants. Starting with the specific gravity, it outlines in detail all the usual tests made to determine the adaptability of various lubricants for various conditions, such as the selection of a low viscosity oil for fast speed and tight journals; a high fire test oil for high temperatures; and a low cold test for ice machine oil. Mineral, vegetable and animal oils are treated, showing the method of examination of these, with complete specifications, as adopted by railroads and others for their purchase, with cuts of apparatus used in the laboratory testing. There is one chapter by P. H. Conradson, chief chemist of the Galena Signal Oil Company, on apparatus for the examination and study of the behavior of valve

and cylinder oils and other petroleum and lubricating oils in saturated steam and superheated steam, carbon dioxide, air and other gases.

The book does not attempt to do much toward pointing out the grade of lubricant to use for various purposes, nor does it enter into the economy of lubrication, which is a subject that is recently receiving much attention by engineers and one that has developed the lubrication engineer and resulted in much substitution of grease and graphite in place of oil. The book is valuable to all those interested in the laboratory testing of oils and in the preparation of specifications for their purchase.

A book entitled "The Cost of Power," under the authorship of Gerald B. Gould and Carleton W. Hubbard, has been published by the Fuel Engineering Company of New York, 106 East Nineteenth street, New York City. It is a presentation of the principles of that part of the power problem involving the selection, purchase and use of coal, and the book aims to cover the subject so that it will appeal primarily to the business man. While it has been divided so that it partakes of the nature of a manual, it is, of course, devoted to the business of the Fuel Engineering Company of New York, which acts as a consulting fuel engineer, it is stated, to some 200 manufacturers, and to this extent the book is a special form of trade publication. Its title page explains that the price is $2 and the book itself is a handsome publication of 124 gilt edge pages bound in flexible leather covers.

Selecting Common Labor by Standard Physical Test

Brief Test Based on Work to Be Done to Determine Mental and Muscular Fitness

BY J. D. HACKETT

The rapidly increasing cost of labor, the necessity for efficiency, accident prevention and the pension system all demand that labor should be chosen with a care which has hitherto been exercised in only a few plants. Recent legislation renders the selecting of labor an imperative necessity in "the dangerous trades." It is also a safeguard against much dissatisfaction which results to employer and employee, when, in spite of a medical examination, the latter is found to be unfit for the work which he is expected to do; for a man may be physically sound but under-developed.

If a test, at once efficient and simple, can be used to determine the physical capability of a workman, much good will result to the employer; because he can tell where a man can be most useful, and this is of equal importance to the employee. At the present time men are gathered round the labor office, if there be such a place, anxiously waiting for work. Superficially they are physically suitable, but a few days' trial demonstrates that they are really unsuited for the work, and they are discharged. In some factories the choice of workmen is entirely in the hands of foremen, who, by constant practice, are able to make a guess as to the capability of a workman by mere inspection; but it is at best a guess, and it is obvious that any system which would even approximately tell what a man could do would be a very useful thing.

The plan, then, is to find out by experiment what particular muscular development is needed for certain jobs and then make a test in accordance with the ascertained requirements. For instance, in some factories men are required for pushing, pulling or lifting material and those duties are to be performed quickly in a certain way. The problem therefore resolves itself into a test of how much a man can push, pull or lift. To determine this properly a scale can be used to register in pounds just exactly what a man can accomplish in pushing, pulling and lifting and how quickly he takes to do it.

The directions for making the test are read out to each man in exactly the same order and an idea of his mentality is obtained by noting how quickly and accurately he follows the directions. The workman is addressed as follows:

> Here is a machine; pull handle No. 1; push handle No. 2; lift handle No. 3 as quick and as strongly as you can.

There is, of course, no limit to the range of tests which may be used, and tests for sledging and digging, where that kind of work is most in demand, can easily be applied.

Standards may be obtained by testing the capacity of men actually engaged in the work for which help is needed and only applicants who can come within 75 per cent. of the standard need be considered. The results are entered on a card so that the foreman may know exactly what to expect from his men. Those who show particular efficiency in any one kind of muscular effort are assigned to duties in conformity with their strength and intelligence in following directions.

If men are required for general laboring work and four tests are made, the sum of the figures divided by four gives the physical index. For instance, the scale shows that a man can lift 340, pull 320 and push 360, the aggregate divided by three gives 340, which is the physical index. The test may be elaborated by taking into account the number of seconds taken in carrying out the work, and if the directions are misunderstood or if the proper sequence is not observed, due note is taken of it. Physical standardization carried out according to the above plan is so simple that it can be applied by an office boy and it has the advantage of securing labor chosen and placed according to the aptitudes shown and not according to race, class or creed.

The World's Coal Production

The United States Geological Survey estimates the world's output in 1913, at 1,443,393,052 net tons, the tables being prepared by W. G. Gray, statistician of the American Iron and Steel Institute. In the 14 years from 1899 to 1913 the coal production of the United States, now first in the world, increased from 253,741,192 tons to 570,048,125 net tons, a gain of nearly 125 per cent. The production in Great Britain in the same period increased a little over 30 per cent., or from 246,506,155 tons to 321,922,130 tons. Germany, which ranks third among the coal-producing countries of the world, has increased its production 88 per cent., nearly three times that of Great Britain, or from 149,719,766 tons in 1899 to 281,979,467 tons in 1912. The combined production of Great Britain in 1913 and Germany in 1912 was 603,901,597 net tons, which exceeded that of the United States alone by less than 6 per cent. Austria-Hungary comes next to Germany as a coal producer with 56,954,579 tons. The other leading producing countries follow in this order: France, 45,108,544 tons; Russia, 31,752,744 tons; Belgium, 24,322,851 tons.

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THE IRON AGE

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The Birmingham Steel Meeting

The meeting of iron and steel manufacturers at Birmingham last week had a rare interest and significance. It was the first time the natural resources of that district and the extensive equipment for their conversion into pig iron and steel had come under the inspection of Northern leaders in the industry since millions from the earnings of Northern works had been used to give Birmingham an assured position among the steel centers of the country. Another unique feature was that the corporation which without dissent was credited with putting Birmingham where she is to-day in the steel trade, was at the time of the meeting under bombardment of Government attorneys as an illegal institution which should be destroyed. Also noteworthy was the admitted growth at Birmingham of a sentiment against the legislation bearing the name of Birmingham's representative at Washington, on the ground that it had done great injury to all capital and labor in the country engaged in the production of iron and steel.

Yet another outstanding feature of the meeting was the address of President Gary, who, in giving the struggle for commercial supremacy as the main cause of the European war, urged that the principle of conciliation and cooperation for which the American Iron and Steel Institute stands should never be abandoned. The sentiment was warmly applauded by the convention, as was the assertion that steel masters can faithfully represent their stockholders and engage in the keenest competition without doing anything destructive, oppressive or unfair. Evidently Judge Gary regards the Federal Trade Commission as an instrument for the furtherance of proper cooperation, rather than for restoring the "old-time competition" which has been aimed at in the campaign against big business. Such, at least, is the inference from his reference to legislation providing for a commission to make effective what the steel men have cultivated in the past seven years.

The Birmingham meeting did good service in linking up the Alabama steel industry of to-day with the period of pioneering in which so many hopes were raised and so few were realized. The excellent historical papers brought out distinctly the period of beginnings, in which the prospector and promoter figured largely; the period of transition in which the weakness of the Southern situation was borne in upon investors, but with it a large promise of ultimate success; and finally the period of permanence, in which vast sums have been spent to get ready for profits making some approach to results in the North. In the old days capital had been drawn into Alabama by the lure of cheap raw materials. Juxtaposition of ore, coal and flux, so close that standing on a blast furnace top one could send successive rifle balls into an iron mine, a coal mine and a limestone quarry, was the first and the last word of the promoter. It took time to learn that another juxtaposition was very necessary—a juxtaposition of consuming territory; also that economies in practice, management and organization had been very unwisely omitted from the early reckonings. By a train of events never dreamed of by the men of vision and venture, whose courage laid the foundations of iron making in Alabama, there came in due time the needed millions, the management, the better practice and the organization, and to-day hopes long deferred are well on the way to fulfillment. The Iron and Steel Institute meeting was a fine revelation to Northern steel masters of what a strong corporation has wrought from that which it found at Birmingham and the other indispensable things which it brought in its own hands.

Nearing the Turning Point

The fact ought readily to be apprehended that the more rapidly demand for steel products declines, in circumstances like the present, the sooner a turning point will be reached. The current demand for steel cannot possibly be regarded as any measure of the average demand that should exist during this war, a war that will last many months if not two or three years. It is commonly said that war conditions, being entirely novel, make it impossible to judge the future, but that view is not entirely correct. In all industrial depressions there are certain fundamental factors that work out through the operations of men's minds into certain business or commercial conditions. There is, for instance, a fear of the future that makes a jobber draw upon his stocks and curtail his specifications to the mills, until a point is reached when that policy can no longer be pursued because the stocks are exhausted. The war has introduced a new and untried condition, but not new mental processes. The fears engendered by the war led to curtailment of stocks just as other fears have done in the past, and the great financial disturbance caused by the war resulted in tight money just as a financial panic results in tight money.

Thus there are certain rules that still hold good. It has always been the case, in an industrial or financial depression, that demand upon the mills for steel passed below the actual rate of consumption of the country. It was not a case of demand and production gradually dwindling until a fixed level was reached, that level to be maintained indefinitely, or until new fundamental conditions intervened to effect a change. It was a case of market demand passing below a certain line and then rebounding to that line or to a point above it. Necessarily there would be a turning point. At this point it might be suggested that experience furnishes no guide. In the past the steel trade has never dropped below a 50 per cent. rate of operation for a period of three months, and a 40 per cent. rate has rarely been touched. The difference at present is not in character but in degree. All records as to lightness of production having already been passed, and the rate of production being clearly on the down grade of late, it is evident that the turning point has been reached or is near at hand. Really the more important question is how far the prospective improvement will extend.

Once the steel trade has started to mend, there will be important influences to help it along. Of fundamental importance are the large crops, months ago regarded as a favorable factor, but now a vastly more favorable one, seeing that the war has increased the world's demand upon us, that harvests in some countries are decreased, and that in many countries outside the United States next year's harvests will be light.

As to the new banking system to be formally put in operation November 16, there is an absolute consensus of opinion, not only that the supply of loanable funds will be largely increased, but the quantity actually loaned. Bankers are practically a unit in declaring that the new system will result in their studying commercial credits as a science, something they really have not done heretofore, and that a large extension of commercial loans will quickly result. No large extension would be needed, moreover, to make a very favorable impress upon business, because financial accommodations have been enormously restricted in the past three months, and as business has been slowed down the requirements are greatly decreased, so that even a small influence, where a large one is promised, would effect an improvement in business.

A third favorable influence in the steel trade, once the turning point has been passed, is that no serious issue exists as to prices, no deadlock between buyer and seller—whereas toward the close of every steel depression in the past the question of prices has been of paramount importance. Near the close of the depression centered in the year 1908, for instance, prices eventually became the main issue, as they had not been during the main portion of that depression. Again in 1911 prices were an issue in retarding the increase in steel orders, for the statistics are clear that for several months, from midsummer to about the close of November, demand increased while prices were falling. During that period the increase in demand would have been more marked if prices had already found their low point and had begun to show firmness. This time such retarding influence promises to be lacking. A trading basis, satisfactory to at least one party, the buyer, will undoubtedly be found quite readily. Steel prices are already very low and war conditions have so changed values in various lines of trade, both upward and downward, that the buyer will not have his pet theories as to steel prices as he has always had in the past.

Iron and steel demand from the belligerent countries promises to increase. Some of them, at least, will hardly be able to maintain production sufficient for their war requirements. Statistics of German pig-iron production in August, just at hand, show a decrease from July of precisely 60 per cent., from 1,564,345 tons to 625,927 tons. Demand from neutral countries, although it may be relatively light for a long time, is bound to increase from the average of the past three months, and with Germany and Belgium entirely out of the running the United States should feel an important effect. The fact that great mistakes of judgment were made early in August as to impending export demand should not lead us to ignore or underrate the better prospects of to-day.

Efficiency in Hiring

For the first strongly convincing exhibition of the costliness of present-day practices in employing men, the industrial world owes much to the National Machine Tool Builders' Association and to M. W. Alexander. To the association is due the credit of discovering the man with the facts and of inducing him to give them. To the man is due the credit of a painstaking investigation and a willingness to discuss much of what is still largely confidential between him and the manufacturers consulted. Considerable space was given to the address in our last issue. It is not new to say that most employment work is inefficient, nor that it is costly; for an article in the first issue of *The Iron Age* this year touched on this fact. The generalizations which have been finding their way into print show a growing recognition of the need of changing methods. The latest contribution is new in being specific, and in showing how much greater is the waste than imagined.

Mr. Alexander's analysis of what makes up the cost of introducing green hands in a factory is unusually complete. One reason why the losses have not been apprehended heretofore is that cost figures have not shown up the time losses and material and equipment wear and tear and destruction. The waste has not been tabulated in balance sheets, nor has the bank account apparently suffered. In other words, some of the costs, such as increased depreciation of factory property, though properly chargeable to the employment department, as Mr. Alexander explains, represent book losses which do not directly affect immediate dividend earning capacity.

The showing will not only stimulate some manufacturers to canvass their own conditions, but it will lend strength to the occasional attempt of manufacturers' local associations to provide for a variety of industries in a given center which do not all have a peak labor demand at the same time. In many ways the factory which is so managed that the number of its employees does not vary between wide limits helps the town; but it follows that it is not always possible to anticipate seasonable fluctuations and the solution of the problem is the group-

ing of industries having intense periods of production coming one after the other over the year. Scientific management is helping the single factory to minimize the hiring waste and the wide variation in numbers, and boards of trade are grappling with the broader problem.

In this connection the report on the study of Richmond industrially, to be made at a meeting in December of the National Association for the Promotion of Industrial Education, may have much by way of suggestion. In the meantime Mr. Alexander's study undoubtedly stands as the most complete presentation of employment wastes yet made, especially when their concrete terms are considered.

The Cast-Iron Pipe Trade

Probably no other branch of the iron trade is in as unsatisfactory a condition, with less reason for it, than the cast-iron pipe trade. Such financial reports as have been made public by corporations manufacturing pipe have shown that in the fiscal year ended June 30, 1914, operations resulted in deficits. It may be assumed that the conditions thus disclosed in regard to these companies apply equally to other manufacturers whose sole output is cast-iron pipe. Such an outcome of business operations by a manufacturer plainly means that he has been selling his product below cost.

Some of the prices now prevailing are reminders of previous periods of depression in this industry. In looking back over the records of such times as given in *The Iron Age* we have observed that in the spring of 1892 the following remarks were made in the editorial columns of the paper: "The manufacturers of cast-iron pipe are now passing through the vale of adversity. Excessive competition has reduced prices in this branch of trade until it is difficult to see how manufacturers are able to recoup themselves for the mere cost of the materials they use and the labor they employ. Within the past month a contract for 2500 tons has been placed at $22.47 per ton delivered at Minneapolis. An inquiry for a small quantity for Chicago promptly brought one of the officers of a very large concern to interview the intending purchaser and the transaction was closed at $22 delivered."

Low as these prices were, however, they were not as low as those made in 1897 and 1898 when cast-iron pipe was sold at Chicago between $15 and $16 per ton. It may be remarked in passing that even when pipe was sold at these low prices the relative price of pig iron and pipe would not make the price per ton of pipe as low as at the present time, the pipe founders then being able to buy pig iron as low as $9 per ton. The depth reached in 1897, however, was due to exceptional circumstances which are not likely to be repeated and which had never before existed. The years 1897 and 1898 covered not only a period in which the business of the entire country had been prostrated by the severe contest over the establishment of a currency standard for this country, but they also marked the time when the iron trade of the country had been placed on a low basis of production cost by the discovery and utilization of the great Mesaba ore deposits in Minnesota. The conditions thus prevailing may be considered as phenomenal rather than as marking a mere dip in the fluctuations of the business. What we are now passing through can be more logically compared with conditions prevailing in 1892.

Unless some change for the better occurs in this trade, great danger exists that failures may take place among the pipe manufacturers. They cannot conduct business for any considerable length of time in selling their product below cost. One important firm is now in the hands of a receiver, due principally to a disagreement among the owners, but it can safely be assumed that if the business was affording a satisfactory profit means would have been devised by which the disagreement would not have come to the point of an application for receivership.

The expression in the opening sentence of this article, "with less reason for it," is used deliberately. In many branches of the iron trade buyers are purchasers of the product for the purpose of fabricating or manipulating it in some other marketable form or are buyers for the purpose of selling again at some profit. In the case of the pipe trade, however, the buyers are either municipalities operating water works or gas-making plants or they are public utility corporations conducting water works or gas-making plants to serve their respective localities. All these buyers of cast-iron pipe merely purchase this product for the purpose of distributing water or gas and do not convert the pipe into some other form, nor do they buy it for the purpose of making a profit on it. They are of course desirous of making their purchases of pipe at as low price as possible, but any one of such buyers would pay without complaint a price affording a fair profit to the manufacturer. It may therefore be assumed that no pressure is being applied to the pipe manufacturers by their customers in the effort to force them down to lower and lower prices but that the unremunerative condition of the pipe trade is wholly due to the competition for business among the pipe manufacturers themselves. It would seem as if this branch of trade is one in which more enlightened views should prevail with regard to the conduct of the business. All are suffering from this excessive competition and all should endeavor to avoid the naming of prices below a figure allowing a reasonable profit. This condition of self-restraint has been known to exist in other branches of business in and out of the iron trade, and no good reason can be found why it could not be brought about in the cast-iron pipe industry.

The Coal Mining Institute of America will hold its Winter meeting in the Fort Pitt Hotel, Pittsburgh, December 8 and 9. Jesse K. Johnson, Pittsburgh, is president. A number of papers relating to the coal industry will be presented, and on the evening of December 8 the annual dinner will take place. Prof. H. H. Stoek, Urbana, Ill., and T. L. Lewis, Columbus, Ohio, will speak on "Government Control with Relation to Coal-Mining Industry." Charles L. Fay, Wilkes-Barre, Pa., is secretary and treasurer.

The Allis Chalmers Mfg. Company, Milwaukee, Wis., reports for the quarter ended September 30, 1914, gross sales of $2,532,545, and net profits of $18,873. Unfilled orders on hand September 30 amounted to $2,638,570.

The Railroad Rate Rehearing

WASHINGTON, D. C., November 2, 1914.—Argument on the rehearing of the application of the Eastern railroads for a 5 per cent. rate advance was concluded before the Interstate Commerce Commission October 30. As to the outcome, doubt is expressed by the most experienced observers. When the hearing began, the outlook for a decision favorable to the railroads was bright and their case seemed steadily to gain in strength. The only witness against the carriers was an attorney for several shippers' associations and for certain Western railroad commissions. The apparent withdrawal of the protestants in the iron and steel industry was specially significant. Nevertheless, from the beginning of the argument October 29, a curious psychological change appeared to come over the members of the commission and it was clearly to be seen that some of them were smarting under the severe criticism to which they have been subjected since the adverse decision in the original case was announced. From the tenor of questions propounded to the attorneys and comments made upon points in the argument, the commission would appear to be divided and it is the best opinion here that the verdict, whether favorable or adverse, will not be unanimous.

If the opponents of the increase presented no testimony in behalf of their contentions, there was no lack of opposition in the arguments. The advance was opposed by Louis D. Brandeis, special counsel for the commission; F. B. James and F. E. Paulson, representing shippers of brick and tile; Frank Lyon and Charles M. Johnston, who appeared for Pennsylvania coal producers; Luther M. Walters, representing lumber and live stock shippers; Rush Butler, general counsel for the Chicago Association of Commerce, and Clifford Thorne, attorney for various shippers' associations and state railroad commissions.

A contention of the opponents of the proposed advance that undoubtedly impressed the commission was put forward by Mr. Brandeis. He declared with much emphasis that the commission had no constitutional right to grant the proposed advance on the grounds submitted. The only new reason for raising rates put forward by the carriers, he said, was that the market for railroad securities was depressed by the European war. No evidence had been submitted, he insisted, to show that a single rate was unreasonably low. The commission's authority to raise rates, he declared, was limited strictly to granting advances where existing rates were specifically shown to be inadequate. If the commission should allow the carriers' plea on the evidence submitted in this case, it would "exceed its legal and constitutional powers and invade the province of Congress, which alone has the right to formulate and declare governmental policies." Questions propounded to Mr. Brandeis by members of the commission suggested that if the decision is adverse it may be based upon the assertion by the commissioners of a doubt as to their authority to grant relief on the grounds put forward by the carriers.

A determined effort was made by counsel for the carriers to remove the impression which Mr. Brandeis's argument appeared to have made upon the commission. George F. Brownell, of the Erie system, in closing for the railroads, declared that it was not the contention of the carriers that the commission had the power to approve rates that would be unjust or unreasonable merely on the ground that such action would "stimulate business," or "restore confidence in the financial or business world," or accomplish any other such result, although such accomplishment might be very desirable in itself. It was contended, however, that in determining whether the carriers' charges for transportation services are just and reasonable the commission has the right, and it is its duty, to take into consideration among other things the adequacy of the net operating income derived therefrom, its sufficiency to enable the carrier properly to perform its important quasi-public functions and to secure the new capital therefor.

By consent of the commission and counsel for both sides, the filing of briefs has been dispensed with and it is understood that the commission has already taken the case up for consideration with a view to disposing of it before December 1. W. L. C.

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American Business Men in British Eyes

In *The Iron Age* for September 24 the visit of Percy G. Donald, of Rownson, Drew & Clydesdale, Ltd., 225 Upper Thames street, London, to this country, representing a syndicate of wholesale builders' hardware merchants, was mentioned. The London Ironmonger of October 10 thus refers to his return to England: "Mr. Donald has found what he wanted, and the German products are deposed by Canadian wire nails and United States hardware, and this in spite of the fact that he found business men in the United States suffering from the most unreasoning financial panic, and unwilling at first to consider any other terms than cash before delivery. They were in a blue funk, in fact; but if we may judge from the lengthy accounts of the Percyan peregrinations that fill the transatlantic trade papers, Mr. Donald talked them out of that. Mr. Donald much admires the New York Hardware Club, where he addressed an audience of 50 manufacturers and merchants, but he found that the Americans had quite as much of the 'You'll have to take this,' 'That's the way we pack it,' and 'We can't quote delivered on your side' spirit in them as is usually ascribed to the conservative Britisher. In fact, in some respects their business ways are more conservative than our own."

The American Locomotive Company has received an order from the Cleveland, Cincinnati, Chicago & St. Louis for 10 switching locomotives. The railroads of the Russian government are reported as inquiring for quotations on a number of locomotives as well as 400 freight cars.

OUTPUT STILL DECLINING

Pig-Iron Production Past Month Least Since January, 1911

A Net Loss of 18 Furnaces in October—Increase in Ferroalloy Output

October statistics record a still further decline in pig-iron production. The total for the month was 1,783,045 tons, the lowest since January, 1911, or 57,518 tons a day, as compared with 1,882,577 tons, or 62,753 tons a day in September. The output of steel-making pig iron declined from 1,390,322 tons in September to 1,242,557 tons in October, or 6261 tons per day. The production of spiegeleisen and ferromanganese, which is included in the above figures, increased from 13,786 tons in September to 17,435 tons in October. Furnaces are still going out of blast and on November 1 there were only 158 on the active list, or 18 less than on October 1. The capacity of the furnaces active on November 1 was 53,253 tons a day as compared with 60,427 tons October 1.

DAILY RATE OF PRODUCTION

The daily rate of production of coke and anthracite pig iron by months, from October, 1913, is as follows:

Daily Rate of Pig-Iron Production by Months—Gross Tons

	Steel works	Merchant	Total
October, 1913	59,630	22,503	82,153
November	52,434	22,019	74,453
December	41,879	22,108	63,987
January, 1914	40,691	20,117	60,808
February	47,479	19,974	67,453
March	54,990	20,748	75,738
April	54,508	21,157	75,665
May	47,028	20,478	67,506
June	44,321	19,595	63,916
July	45,027	18,123	63,150
August	46,937	17,426	64,363
September	46,344	16,409	62,753
October	40,083	17,435	57,518

OUTPUT BY DISTRICTS

The accompanying table gives the production of all coke and anthracite furnaces in October and the three months preceding:

Monthly Pig-Iron Production—Gross Tons

	July (31 days)	Aug. (31 days)	Sept. (30 days)	Oct. (31 days)
New York	118,471	117,567	109,569	113,866
New Jersey	10,825	10,698	8,559	6,860
Lehigh Valley	60,714	52,112	49,115	57,905
Schuylkill Valley	67,056	66,584	56,604	55,171
Lower Susquehanna and Lebanon Valley	31,250	32,163	31,217	33,988
Pittsburgh district	455,873	507,250	483,973	440,704
Shenango Valley	67,291	70,752	68,391	65,267
Western Pennsylvania	125,364	99,178	104,778	109,217
Maryland, Virginia and Kentucky	51,150	49,561	38,186	31,809
Wheeling district	72,318	72,787	80,289	75,014
Mahoning Valley	216,134	237,909	214,916	195,910
Central and Northern Ohio	140,181	140,019	126,208	130,963
Hanging Rock and S. W. Ohio	19,944	15,118	11,314	17,992
Chicago district	289,368	287,533	267,339	226,012
Mich., Minn., Mo., Wis. and Col.	61,423	62,643	63,258	48,873
Alabama	151,612	156,623	152,453	157,239
Tennessee	18,671	16,764	16,408	16,255
Total	1,957,645	1,995,261	1,882,577	1,783,045

PRODUCTION OF STEEL COMPANIES

Returns from all furnaces of the United States Steel Corporation and the various independent steel companies show the following totals of product month by month. Only steel-making iron is included in the figures below, together with ferromanganese, spiegeleisen and ferrosilicon. These last, while stated separately, are also included in the columns of "total production."

Production of Steel Companies—Gross Tons

	Pig, total production			Spiegeleisen, ferromanganese, etc.		
	1912	1913	1914	1912	1913	1914
Jan.	1,483,153	1,981,560	1,261,430	22,622	15,633	17,325
Feb.	1,550,995	1,792,154	1,329,414	15,950	20,131	10,524
Mar.	1,827,792	1,904,878	1,704,688	11,538	20,546	20,133
Apr.	1,830,717	1,939,751	1,635,226	11,104	23,108	18,676
May	1,922,557	1,991,192	1,457,847	20,518	19,042	21,504
June	1,823,958	1,860,070	1,329,623	26,685	19,212	16,254
July	1,803,205	1,840,216	1,395,851	26,522	22,310	16,524
Aug.	1,843,404	1,833,352	1,455,054	24,225	20,680	11,577
Sept.	1,773,073	1,828,232	1,390,322	22,484	24,555	13,786
Oct.	1,947,426	1,848,634	1,242,557	27,252	19,499	17,435
Nov.	1,884,524	1,573,007	.....	17,461	26,765	.....
Dec.	1,976,870	1,298,262	.....	18,523	14,095	.....

CAPACITY IN BLAST NOVEMBER 1 AND OCTOBER 1

The following table shows the daily capacity in gross tons, of furnaces in blast November 1 and October 1, by districts:

Coke and Anthracite Furnaces in Blast

Location of furnaces	Total number of stacks	Nov. 1 Number in blast	Nov. 1 Capacity per day	Oct. 1 Number in blast	Oct. 1 Capacity per day
New York:					
Buffalo	19	9	3,030	10	3,213
Other New York	7	2	450	2	440
New Jersey	7	1	221	1	215
Pennsylvania:					
Lehigh Valley	22	7	1,691	7	1,541
Spiegel	2	2	177	2	153
Schuylkill Val.	16	5	1,780	5	1,807
Lower Susquehanna	7	2	535	2	519
Lebanon Valley	10	3	561	3	521
Pittsburgh Dist.	52	27	12,555	32	15,214
Ferro.	4	2	217	2	221
Shenango Val.	19	5	1,825	7	2,145
Western Pa.	26	11	3,472	11	3,493
Ferro.	1	1	94	0	0
Maryland	4	1	384	1	382
Wheeling Dist.	11	5	1,745	7	2,676
Ohio:					
Mahoning Val.	25	12	5,451	16	6,887
Central and Northern	24	10	4,225	10	4,002
Hanging Rock & S. W. Ohio	15	5	580	4	439
Ill. and Ind.	34	14	6,327	18	8,655
Ferro.	2	1	66	1	48
Michigan, Wis. & Minn.	10	3	810	5	1,349
Colo. and Mo.	8	2	750	2	759
The South:					
Virginia	24	3	378	3	418
Kentucky	5	2	264	2	317
Alabama	45	18	5,072	18	5,000
Ferro	1	1	68	1	85
Tennessee	20	4	525	4	547
Total	423	158	53,253	176	60,427

DIAGRAM OF PIG-IRON PRODUCTION AND PRICES

The fluctuations in pig-iron production from January, 1907, to the present time are shown in the accompanying chart. The figures represented by the heavy lines are those of daily average production, by months, of coke and anthracite iron. The two other curves on the chart represent monthly average prices of Southern No. 2 foundry pig iron at Cincinnati and of local No. 2 foundry iron at furnace at Chicago. They are based on the weekly market quotations of *The Iron Age*. The figures for daily average production are as follows:

Daily Average Production of Coke and Anthracite Pig Iron in the United States by Months Since January 1, 1907—Gross Tons

	1907	1908	1909	1910	1911	1912	1913	1914
Jan.	71,149	33,918	57,975	84,148	56,752	66,384	90,172	60,808
Feb.	73,038	37,163	60,976	85,616	64,090	72,442	92,369	67,453
Mar.	71,821	39,619	59,232	84,459	70,036	77,591	89,147	75,738
Apr.	73,885	38,289	57,962	82,792	68,836	79,181	91,759	75,665
May	74,048	37,603	60,753	77,102	61,079	81,051	91,039	67,506
June	74,486	36,444	64,656	75,516	59,585	81,358	87,619	63,916
July	72,763	39,287	67,793	69,305	57,841	77,738	82,601	63,150
Aug.	72,594	42,851	72,546	67,963	62,150	81,046	82,057	64,363
Sept.	72,783	47,300	79,507	68,476	65,903	82,128	83,531	62,753
Oct.	75,386	50,554	83,856	67,520	67,811	86,722	82,133	57,518
Nov.	60,937	51,595	84,917	63,659	66,648	87,697	74,453	.....
Dec.	39,815	56,158	85,022	57,349	65,912	89,766	63,987	.....

THE RECORD OF PRODUCTION

Production of Coke and Anthracite Pig Iron in the United States by Months Since January 1, 1910—Gross Tons

	1910	1911	1912	1913	1914
Jan.	2,608,605	1,759,326	2,057,911	2,795,331	1,885,054
Feb.	2,397,254	1,794,509	2,100,815	2,586,337	1,888,670
Mar.	2,617,949	2,171,111	2,405,318	2,763,563	2,347,867
Apr.	2,483,763	2,064,086	2,375,436	2,752,761	2,269,955
May	2,390,180	1,893,456	2,512,582	2,822,217	2,092,686
June	2,265,478	1,787,566	2,440,745	2,628,565	1,917,783
July	2,148,442	1,793,068	2,410,889	2,560,646	1,957,645
Aug.	2,106,847	1,926,637	2,512,431	2,545,763	1,995,261
Sept.	2,056,275	1,997,102	2,463,839	2,505,927	1,882,577
Oct.	2,093,121	2,102,147	2,689,933	2,546,261	1,783,045
Nov.	1,909,780	1,999,433	2,630,854	2,233,123	.....
Dec.	1,777,817	2,043,270	2,782,737	1,983,607	.....

Among the furnaces blown in last month were Dunbar in western Pennsylvania and Hasleton No. 1 in the Mahoning Valley.

The furnaces blown out in October include one Lackawanna and one Niagara in New York, one Clairton, one Duquesne, one Edgar Thomson, one Isabella and one Monongahela in the Pittsburgh district, New Castle No. 3 in the Shenango Valley, two Mingo in the Wheeling district, one Ohio, Mary, Mattie, Haselton No. 3 and one Youngstown Sheet & Tube Company stack in the Mahoning Valley, one Joliet, one South Chicago and two Gary in the Chicago district and Zenith in Minnesota.

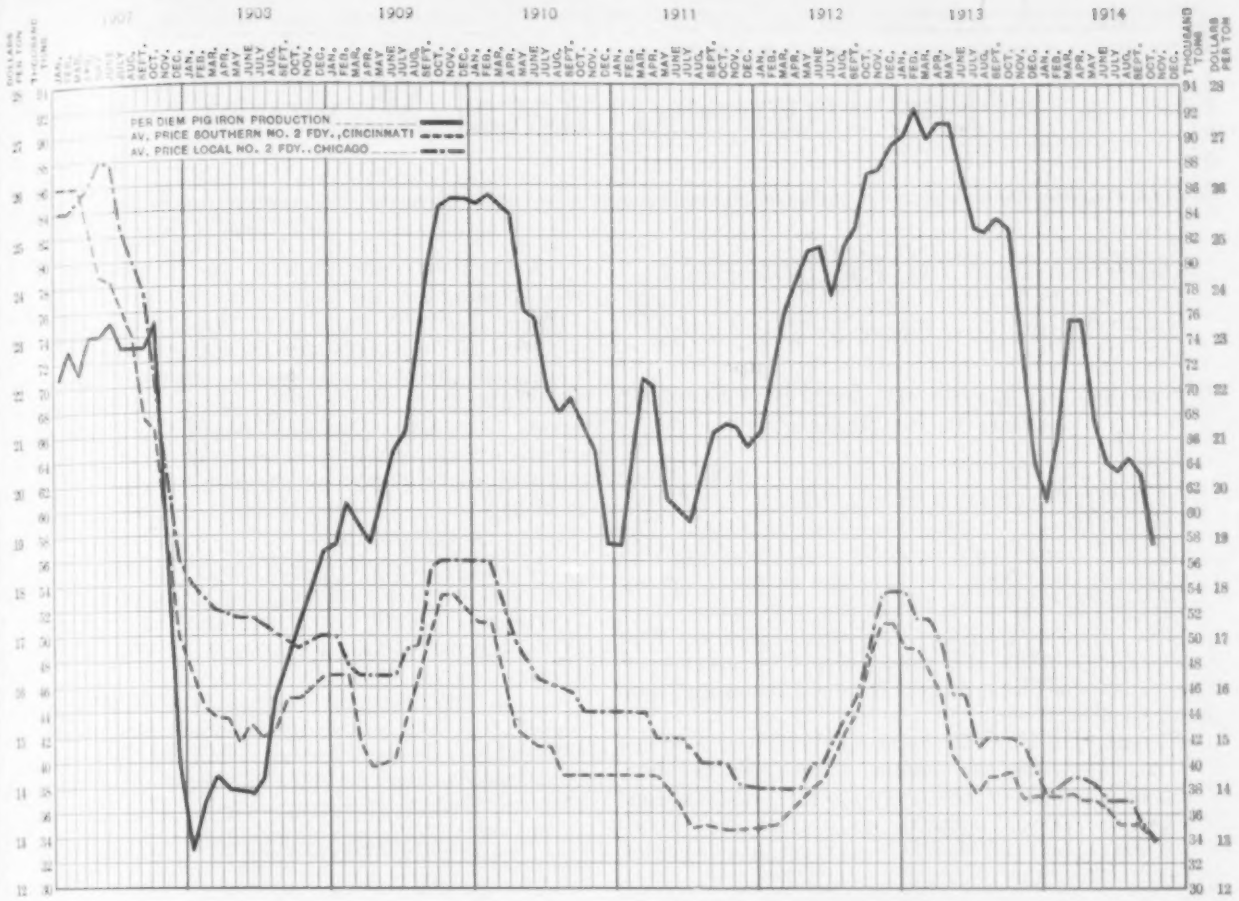


Diagram of Daily Average Production by Months of Coke and Anthracite Pig Iron in the United States from January 1, 1907, to November 1, 1914; Also of Monthly Average Prices of Southern No. 2 Foundry Iron at Cincinnati and Local No. 2 Foundry Iron at Chicago District Furnace

The British Steel Trade and the War

Conditions in the British iron market are given in the Daily Consular and Trade Reports by Consul Albert Halstead, of Birmingham, England, writing under date of September 25, as follows:

Many of the iron and steel industries in this section have received enormous government orders, which have produced great activity. Included among these are those for hurdle iron, fencing and barbed wire, miles of which are required, aggregating thousands of tons. Tubular fencing has also been in considerable demand. Large orders have also been received from the French and Russian governments for material made of iron and steel that had never previously come to the Birmingham district. Cable advices have come from South Africa for larger requirements.

The trade papers note that there has been a quickening demand from the South American markets for iron and steel goods by reason of the stopping of German shipments, but the latter orders are reported as not being anxiously sought because of possible "trouble to get payments."

There are inquiries for bars, and wire manufacturers are seeking rods. Makers of black plates have large orders from manufacturers of soldiers' bottles, while the tin-plate makers have orders for tin plates for mess tins. Iron for cutlery purposes is actively demanded, while the makers of road axles for artillery and transport wagons are busy.

It is calculated that the imports of iron and steel into the Birmingham consular district had, prior to the war, been averaging about 2,500,000 gross tons, most of which came from Germany, and that in 15 years the German exports of iron and steel had increased 500 per cent. or ten times that of the British. Makers of machines for stamping and pressing, as well as of other machine tools, report an increase of orders from British manufacturers who desire to produce many classes of aticles not previously made in England. Birmingham makers of machine tools and agencies of American machine tools have practically exhausted their supplies of such tools as are suitable for the reproduction of weapons, ammunition, and other war supplies, which have been in large demand, not only for British makers of such munitions of war, but for Germany and Russia as well, it having become imperative to increase the productive capacity in all three countries of plants for the manufacture of war munitions.

Blast Furnace Notes

The Sloss-Sheffield Steel & Iron Company will put out two of its furnaces this week, one at Sheffield and the other at Birmingham, Ala., leaving two of its seven furnaces in blast.

Only three Virginia furnaces were in blast November 1—Alleghany at Iron Gate, Pulaski and one of the Virginia Iron, Coal & Coke Company's Crozer furnaces.

One McKeesport, Pa., furnace of the National Tube Company went out of blast early in October and the production of the Carnegie Steel Company in the Pittsburgh district was considerably reduced by the blowing out of one Clairton furnace, one Duquesne, one Edgar Thomson and one Isabella.

Lake Superior Ore Shipments in October

CLEVELAND, OHIO, November 4, 1914.—Lake Superior ore shipments in October were 4,242,392 tons. This brings the total movement to November 1 up to 30,951,805 tons. Lake shipments for the season will probably be less than 31,500,000 tons.

The Abbott Ball Company, Hartford, Conn., announces that it has perfected special machinery whereby it is able to turn out perfect high-grade bearing balls. It is prepared to furnish all sizes from ⅛ to ½ in. in diameter, and will later be in a position to furnish all other sizes.

The Big Eagle Mining Company, Ottawa, W. Va., desires prices on hoisting equipment.

The Iron and Metal Markets

SOME ENCOURAGEMENT

Steel Trade Now Close to Low Point

Production of Pig Iron and Steel Still Receding —Pipe Prices Reduced

Taking the election results as in no small measure a popular expression on the existing tariff law, the steel trade finds encouragement in them. The belief that there would be such an outcome and the recognition of a slight turn for the better in money conditions, in cotton and in all exports led to more hopeful utterances by the steel manufacturers who met at Birmingham last week than might have been expected from the smallest rate of incoming new business ever known.

Shrinkage in production continues, and November output will show a scaling down from October. Some of the smaller steel companies in the Central West have reduced salaries as well as the wages of mill workers and some Pennsylvania companies have similar reductions under consideration. Predictions of general reductions January 1, from presidents down, are traceable more to the unparalleled hardships of the situation than to any definite decisions.

Our pig-iron statistics show how the industry has been receding. In October production was 1,783,045 tons, or 57,518 tons a day, against 1,832,577 tons in September, or 62,753 tons a day. The October rate was the smallest since January, 1911. The net loss in active furnaces in October was 18, there being 158 in blast as November opened, with 53,253 tons daily capacity, against 176 furnaces and a daily capacity of 60,427 tons one month previous.

Many steel works furnaces have been blown out and the recent increases in pig iron stocks of the steel companies are likely to add more furnaces to the idle list. Average production of steel ingots is now probably nearer 40 than 50 per cent. of capacity, and the Chicago district is below 35 per cent.

The low state of consumers' stocks of finished material, of which one indication is the sustained volume of small-lot buying from jobbers' warehouses, shows that new orders to the mills are under the rate of the country's real consumption and point to larger operations not far ahead.

The present paradox of generally sustained prices and pitifully small demand may be followed by that of yielding prices and larger buying. On a 1.10c., Pittsburgh, market for plates, shapes and bars a large tonnage of the first two would bring out 1.05c. on plates at least, and export plates have sold close to 1c., Pittsburgh.

Steel pipe manufacturers have made a reduction in black and galvanized standard pipe. Discounts were lengthened one point, which would be close to $2 a ton, but the cutting off of the jobbers' extra discount of 2½ per cent. makes the net reduction about $1 a ton.

Export trade in wire products is still good and there is fresh inquiry for barb wire. Horseshoe works will be able to run full until February on European orders.

A Southern company has taken 7000 tons of billets for England and more than half of it has been shipped. British mills have quoted so low on such business as to discourage American sellers.

Partly through attractive offers of Southern iron, foundries are taking more interest in contracts for 1915. Southern No. 2 has been quoted at $10 for the entire first half. At Buffalo pig-iron sales of about 35,000 tons have been made, much of it at $12 at furnace for No. 2 X. Chicago pig iron inquiry is growing also.

In eastern Pennsylvania there has been a better business in low-phosphorus pig iron, but the price has gone off with the appearance of a new competitor in the field, being close to $20, Philadelphia.

Lake ore shipments are tapering off and the season will end early, probably by November 15. The October movement was 4,242,392 tons, making the season's total 30,951,805 tons to November 1. The full season movement will probably be under 31,500,000 tons, against 49,070,000 tons by water last year.

A Comparison of Prices

Advances Over the Previous Week in Heavy Type. Declines in Italics

At date, one week, one month, and one year previous.

	Nov. 4, 1914.	Oct. 28, 1914.	Oct. 7, 1914.	Nov. 5, 1913.
Pig Iron, Per Gross Ton:				
No. 2 X, Philadelphia	$14.50	$14.50	$14.75	$15.75
No. 2, Valley furnace	12.75	12.75	13.00	13.50
No. 2 Southern, Cin'ti	12.90	12.90	12.90	14.25
No. 2, Birmingham, Ala.	10.00	10.00	10.00	11.00
No. 2, furnace, Chicago*	12.75	12.75	13.00	15.00
Basic, del'd, eastern Pa.	14.00	14.00	14.00	15.00
Basic, Valley furnace	12.50	12.50	13.00	13.25
Bessemer, Pittsburgh	*14.55*	14.65	14.90	16.15
Malleable Bess., Ch'go*	13.00	13.00	13.00	15.00
Gray forge, Pittsburgh	13.40	13.40	13.65	14.25
L. S. charcoal, Chicago	15.75	15.75	15.75	15.25
Billets, etc., Per Gross Ton:				
Bess. billets, Pittsburgh	19.50	19.50	20.50	22.00
O.-h. billets, Pittsburgh	19.50	19.50	20.50	22.00
O.-h. sheet bars, P'gh	20.00	20.00	21.50	22.00
Forging billets, base, P'gh.	25.00	25.00	26.00	26.00
O.-h. billets, Phila	*21.40*	22.40	23.40	23.50
Wire rods, Pittsburgh	25.50	25.50	26.00	26.00
Old Material, Per Gross Ton:				
Iron rails, Chicago	11.00	11.00	11.25	13.50
Iron rails, Philadelphia	13.00	13.00	14.00	17.50
Carwheels, Chicago	10.50	10.50	10.75	12.00
Carwheels, Philadelphia	9.50	9.50	10.50	12.00
Heavy steel scrap, P'gh	*10.00*	10.50	11.00	11.50
Heavy steel scrap, Phila	9.50	9.50	10.25	10.50
Heavy steel scrap, Ch'go	8.50	8.50	8.50	9.75
No. 1 cast, Pittsburgh	*10.50*	11.50	11.50	12.00
No. 1 cast, Philadelphia	11.00	11.00	11.50	13.00
No. 1 cast, Ch'go (net ton)	8.75	9.00	9.00	10.25
Finished Iron and Steel, Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Bess. rails, heavy, at mill	1.25	1.25	1.25	1.25
Iron bars, Philadelphia	1.12	1.12	1.12	1.32½
Iron bars, Pittsburgh	1.15	1.15	1.15	1.45
Iron bars, Chicago	0.97½	0.97½	1.00	1.15
Steel bars, Pittsburgh	*1.10*	1.15	1.15	1.30
Steel bars, New York	*1.26*	1.31	1.31	1.46
Tank plates, Pittsburgh	1.10	1.10	1.15	1.30
Tank plates, New York	1.26	1.26	1.31	1.46
Beams, etc., Pittsburgh	*1.10*	1.15	1.15	1.30
Beams, etc., New York	*1.26*	1.31	1.31	1.46
Skelp, grooved steel, P'gh	*1.10*	1.15	1.15	1.30
Skelp, sheared steel, P'gh	*1.15*	1.20	1.20	1.35
Steel hoops, Pittsburgh	1.25	1.25	1.25	1.50
Sheets, Nails and Wire, Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Sheets, black, No. 28, P'gh.	1.90	1.90	1.95	2.00
Galv. sheets, No. 28, P'gh	2.90	2.90	2.95	3.00
Wire nails, Pittsburgh	1.60	1.60	1.60	1.60
Cut nails, Pittsburgh	1.60	1.60	1.60	1.55
Fence wire, base, P'gh	1.40	1.40	1.40	1.40
Barb wire, galv., P'gh	2.00	2.00	2.00	2.00

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Coke, Connellsville, Per Net Ton at Oven:	Nov. 4, 1914.	Oct. 28, 1914.	Oct. 7, 1914.	Nov. 5, 1913.
Furnace coke, prompt	$1.60	$1.60	$1.60	$1.90
Furnace coke, future	1.75	1.75	1.75	2.00
Foundry coke, prompt	2.00	2.00	2.00	2.65
Foundry coke, future	2.15	2.15	2.15	2.75

Metals. Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Lake copper, New York	11.50	11.50	12.00	16.87½
Electrolytic copper, N. Y.	11.25	11.25	11.62½	16.50
Spelter, St. Louis	4.90	4.95	4.80	5.20
Spelter, New York	5.05	5.10	4.95	5.35
Lead, St. Louis	3.37½	3.37½	3.37½	4.20
Lead, New York	3.50	3.50	3.50	4.35
Tin, New York	31.80	30.75	30.87½	40.25
Antimony, Hallett's, N. Y.	15.00	15.00	12.00	7.25
Tin plate, 100-lb. box, P'gh	$3.15	$3.15	$3.30	$3.40

Finished Iron and Steel f. o. b. Pittsburgh

Freight rates from Pittsburgh, in carloads, per 100 lb.: New York, 16c.; Philadelphia, 15c.; Boston, 18c.; Buffalo, 11.6c.; Cleveland, 10.5c.; Cincinnati, 15.8c.; Indianapolis, 17.9c.; Chicago, 18.9c.; St. Louis, 23.6c.; Kansas City, 43.6c.; Omaha, 43.6c.; St. Paul, 32c. (after November 16, 32.9c.); Denver, 68.6c.; New Orleans, 30c.; Birmingham, Ala., 45c.; Pacific coast, 80c. on plates, structural shapes and sheets No. 11 and heavier; 85c. on sheets Nos. 12 to 16; 95c. on sheets No. 16 and lighter; 65c. on wrought pipe and boiler tubes. The foregoing rates to the Pacific coast are by rail. The rate via New York and the Panama Canal on plates, shapes, etc., is 46c.

Plates.—Tank plates, ¼ in. thick, 6¼ in. up to 100 in. wide, 1.10c., base, net cash, 30 days. Following are stipulations prescribed by manufacturers with extras:

Rectangular plates, tank steel or conforming to manufacturer's standard specifications for structural steel dated February 6, 1903, or equivalent, ¼ in. and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per sq. ft., are considered ¼-in. plates. Plates over 72 in. wide must be ordered ¼-in. thick on edge, or not less than 11 lb. per sq. ft., to take base price. Plates over 72 in. wide ordered less than 11 lb. per sq. ft. down to the weight of 3-16 in. take the price of 3-16 in.

Allowable overweight, whether plates are ordered to gauge or weight, to be governed by the standard specifications of the Association of American Steel Manufacturers.

Extras	Cents per lb.
Gauges under ¼ in. to and including 3-16 in.	.10
Gauges under 3-16 in. to and including No. 8	.15
Gauges under No. 8 to and including No. 9	.25
Gauges under No. 9 to and including No. 10	.30
Gauges under No. 10 to and including No. 12	.40
Sketches (including straight taper plates), 3 ft. and over	.10
Complete circles 3 ft. in diameter and over	.20
Boiler and flange steel	.10
"A. B. M. A." and ordinary firebox steel	.20
Still bottom steel	.30
Marine steel	.40
Locomotive firebox steel	.50
Widths over 100 in. up to 110 in., inclusive	.05
Widths over 110 in. up to 115 in., inclusive	.10
Widths over 115 in. up to 120 in., inclusive	.15
Widths over 120 in. up to 125 in., inclusive	.25
Widths over 125 in. up to 130 in., inclusive	.50
Widths over 130 in.	1.00
Cutting to lengths, under 3 ft. to 2 ft. inclusive	.25
Cutting to lengths, under 2 ft. to 1 ft. inclusive	.50
Cutting to lengths, under 1 ft.	1.55

No charge for cutting rectangular plates to lengths 3 ft. and over.

Structural Material.—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in. on one or both legs, ¼ in. thick and over, and zees, 3 in. and over, 1.10c. Extras on other shapes and sizes are as follows:

	Cents per lb.
I-beams over 15 in.	.10
H-beams over 18 in.	.10
Angles over 6 in., on one or both legs	.10
Angles, 3 in. on one or both legs, less than ¼ in. thick, as per steel bar card, Sept. 1, 1909	.70
Tees, structural sizes (except elevator, handrail, car truck and conductor rail)	.05
Channels and tees, under 3 in. wide, as per steel bar card, Sept. 1, 1909	.20 to .80
Deck beams and bulb angles	.30
Hand rail tees	.75
Cutting to lengths, under 3 ft. to 2 ft. inclusive	.25
Cutting to lengths, under 2 ft. to 1 ft. inclusive	.50
Cutting to lengths, under 1 ft.	1.55

No charge for cutting to lengths 3 ft. and over.

Wire Products.—Fence wire, Nos. 0 to 9, per 100 lb., terms 60 days or 2 per cent. discount in 10 days, carload lots to jobbers, annealed, $1.40; galvanized, $1.80. Galvanized barb wire and fence staples to jobbers, $2; painted, $1.60. Wire nails to jobbers, $1.60. Woven wire fencing, 73 per cent. off list for carloads; 72 off for 1000-rod lots; 71 off for less than 1000-rod lots.

The following table gives the price to retail merchants on fence wire in less than carloads, with the extras added to the base price:

Plain Wire, per 100 lb.

Nos.	0 to 9	10	11	12&12½	13	14	15	16
Annealed	$1.55	$1.60	$1.65	$1.70	$1.80	$1.90	$2.00	$2.10
Galvanized	2.00	2.00	2.05	2.10	2.20	2.30	2.70	2.80

Wire Rods.—Bessemer, open-hearth and chain rods, $25.50.

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card on steel pipe in effect from November 2, 1914, and iron pipe from June 2, 1913, all full weight:

Butt Weld

Steel: Inches	Black	Galv.	Iron: Inches	Black	Galv.
⅛, ¼ and ⅜	74	53½	⅛ and ¼	66	47
½	78	67½	⅜	65	46
¾ to 3	81	72½	½	69	56
			¾ to 2½	72	61

Lap Weld

2	78	69½	1¼	56	45
2½ to 6	80	71½	1½	67	56
7 to 12	77	66½	2	68	58
13 and 14	63½	..	2½ to 4	70	61
15	61	..	4½ to 6	70	61
			7 to 12	68	55

Reamed and Drifted

1 to 3, butt	79	70½	1 to 1½, butt	70	59
2, lap	76	67½	2, butt	70	59
2½ to 6, lap	78	69½	1¼, lap	54	43
			1½, lap	65	54
			2, lap	66	56
			2½ to 4, lap	68	59

Butt Weld, extra strong, plain ends

⅛, ¼ and ⅜	69	58½	⅜	63	52
½	74	67½	½	67	60
¾ to 1½	78	71½	¾ to 1½	71	62
2 to 3	79	72½	2 and 2½	72	63

Lap Weld, extra strong, plain ends

2	75	66½	1½	65	59
2½ to 4	77	68½	2	66	58
4½ to 6	76	67½	2½ to 4	70	61
7 to 8	69	58½	4½ to 6	69	60
9 to 12	64	53½	7 to 8	63	53
			9 to 12	58	47

Butt Weld, double extra strong, plain ends

½	64	57½	½	57	49
¾ to 1½	67	60½	¾ to 1½	60	52
2 to 2½	69	62½	2 and 2½	62	54

Lap Weld, double extra strong, plain ends

2	65	58½	2	55	49
2½ to 4	67	60½	2½ to 4	60	54
4½ to 6	66	59½	4½ to 6	59	53
7 to 8	59	48½	7 to 8	52	42

To the large jobbing trade an additional 5 and 2½ per cent. is allowed over the above discounts.

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

Boiler Tubes.—Discounts to jobbers, in carloads, in effect from May 1, 1914, on steel and from January 2, 1914, on iron, are as follows:

Lap Welded Steel		*Standard Charcoal Iron*	
1¾ and 2 in.	62	1½ in.	45
2¼ in.	59	1¾ and 2 in.	49
2½ and 2¾ in.	65	2¼ in.	45
3 and 3¼ in.	70	2½ to 2¾ in.	54
3½ and 4½ in.	72	3 and 3¼ in.	57
5 and 6 in.	65	3½ and 4½ in.	60
7 to 13 in.	62	5 and 6 in.	49

Locomotive and steamship special charcoal grades bring higher prices.

2½ in. and smaller, over 18 ft., 10 per cent. net extra.

2¾ in. and larger, over 22 ft., 10 per cent. net extra.

Less than carloads will be sold at the delivered discounts for carloads, lowered by two points for lengths 22 ft. and under to destinations east of the Mississippi River; lengths over 22 ft., and all shipments going west of the Mississippi River must be sold f.o.b. mill at Pittsburgh basing discount, lowered by two points. On standard charcoal iron tubes for desirable orders the above discounts are shaded an extra 5, and occasionally two 5's by some makers.

Sheets.—Makers' prices for mill shipment on sheets of U. S. Standard gauge, in carload and larger lots, on which jobbers charge the usual advance for small lots from store, are as follows, f.o.b. Pittsburgh, terms 30 days net, or 2 per cent. cash discount in 10 days from date of invoice:

Blue Annealed Sheets

	Cents per lb.
Nos. 3 to 8	1.35 to 1.40
Nos. 9 to 10	1.40 to 1.45
Nos. 11 and 12	1.45 to 1.50
Nos. 13 and 14	1.55 to 1.60
Nos. 15 and 16	1.65 to 1.70

Box Annealed Sheets, Cold Rolled

	Cents per lb.
Nos. 10 and 11	1.55 to 1.65
No. 12	1.55 to 1.65
Nos. 13 and 14	1.60 to 1.70
Nos. 15 and 16	1.65 to 1.75
Nos. 17 to 21	1.70 to 1.80
Nos. 22 and 24	1.75 to 1.85
Nos. 25 and 26	1.80 to 1.90
No. 27	1.85 to 1.95
No. 28	1.90 to 2.00
No. 29	1.95 to 2.05
No. 30	2.05 to 2.15

Galvanized Sheets of Black Sheet Gauge

	Cents per lb.
Nos. 10 and 11	1.90 to 2.00
No. 12	2.00 to 2.10
Nos. 13 and 14	2.00 to 2.10
Nos. 15 and 16	2.15 to 2.25
Nos. 17 to 21	2.30 to 2.40
Nos. 22 and 24	2.45 to 2.55
Nos. 25 and 26	2.60 to 2.70
No. 27	2.75 to 2.85
No. 28	2.90 to 3.00
No. 29	3.05 to 3.15
No. 30	3.20 to 3.30

Pittsburgh

PITTSBURGH, PA., November 3, 1914.

The steel trade is so dull that the depression is believed to be at its worst; that any change must be for the better. Large consumers and jobbers are watching the situation closely, and as soon as prices show a tendency to advance a good deal of business is ready to be placed. Stocks held by jobbers and railroads are lighter than for years, and it will take a large amount of material to give consumers their usual supply. Reports are heard of semi-finished steel being offered at much lower prices than are regarded as the market. It would take a very attractive order, however, to shade 1.10c. on plates, shapes and bars. Axle billets are weaker, but reports that these have been offered at close to $20 at makers' mill are denied. Reductions in wages by iron and steel companies that have not already taken this action are looked for by January 1. In the case of tonnage men in steel works and sheet and tin-plate mills, the reduction is likely to be heavy, as earnings of tonnage men have increased very much in the last year or two.

Pig Iron.—W. P. Snyder & Co. report the average price of Bessemer pig iron in October to have been $13.9375, and of basic, $12.85, both at Valley furnaces, the delivered Pittsburgh price being obtained by adding 95c. freight instead of 90c. as heretofore. The average decline on Bessemer is 6¼c. and on basic 15c., being less than in any one month since last April. New inquiry for pig iron is confined to small lots for prompt shipment. Only four merchant blast furnaces in the two valleys are now running. A sale of 300 to 500 tons of Bessemer iron has been made at about $13.60, Valley furnace. We quote Bessemer at $13.60 to $13.75; basic, $12.50; No. 2 foundry, $12.75 to $13; malleable Bessemer, $12.75, and gray forge, $12.50, all at Valley furnace, with a freight rate of 95c. a ton for delivery in the Pittsburgh district.

Billets and Sheet Bars.—No new buying is reported in either billets or sheet bars, and specifications against contracts in October were less than in September. Sheet and tin-plate mills are running at a less rate than for some time. We quote Bessemer and open-hearth billets at $19 to $19.50, and Bessemer and open-hearth sheet bars, $19.50 to $20, f.o.b. maker's mill, Youngstown; Bessemer and open-hearth billets, $19.50 to $20, and Bessemer and open-hearth sheet bars $20 to $20.50, f.o.b. maker's mill, Pittsburgh. Forging billets are quoted at $25 for sizes up to but not including 10 x 10 in., and for carbons up to 0.25, the regular extras being charged for larger sizes and higher carbons. Forging billets running above 0.25 to 0.60 carbon take $1 per ton extra. Axle billets are lower, being now quoted at $22, f.o.b. Pittsburgh.

Ferroalloys.—Several dealers are offering English 80 per cent. ferromanganese for prompt delivery from stock as low as $60 per ton, and several carloads have sold at this price. Consumers are getting prompt deliveries and considerable quantities are being offered for resale. The official price remains at $68 per ton, f.o.b. seaboard. We quote 50 per cent. ferrosilicon, in lots up to 100 tons, at $73; over 100 tons to 600 tons, $72; over 600 tons, $71, delivered in the Pittsburgh district. On 10 per cent. ferrocilicon the quotation is $19; 11 per cent., $20, and 12 per cent., $21, f.o.b. cars Jackson County, Ohio, or Ashland, Ky., furnace. We quote 20 per cent. spiegeleisen at $25 at furnace. We quote ferrotitanium at 8c. per lb. in carloads; 10c. in 2000-lb. lots and over, and 12½c. in less than 2000-lb. lots.

Steel Rails.—The new demand for standard sections is only for small lots for spot shipment. The Carnegie Steel Company received one order this week from a coal mining company for 500 tons of light rails and last week received new light-rail orders and specifications for about 2200 tons. We quote standard section rails, made of Bessemer stock, at 1.25c., and of open-hearth, 1.34c., f.o.b. Pittsburgh. We quote light rails as follows, in carload lots: 8 and 10 lb. sections, 1.275c.; 12 and 14 lb., 1.225c.; 16 and 20 lb., 1.175c.; 25, 30, 35, 40 and 45 lb. sections, 1.125c. Extras over the above prices are as follows:

Bond drilling, one hole	$0.045 per 100 lb.
Bond drilling, two holes	0.090 per 100 lb.
Bond drilling, one hole in flange	0.090 per 100 lb.
Bond drilling, two holes in flange	0.180 per 100 lb.
All 30 ft. and special lengths, down to but not including 12 ft.	0.045 per 100 lb.
Special lengths, 12 ft. and under	0.090 per 100 lb.
Notching	0.025 per 100 lb.

The above prices are for carload lots, the usual differentials being allowed for large lots.

Structural Material.—Little new work is being given out and inquiry is light. Thomas Riley, Pittsburgh, is low bidder on the Schenley high school, which will require about 1300 tons of steel, not yet placed. The McClintic-Marshall Company has taken 750 tons for a wharf at Balboa, Panama. The American Bridge Company has taken 450 tons for a memorial building at Washington, D. C., and the Mt. Vernon Bridge Company, Mt. Vernon, Ohio, has taken a bridge at Baltimore, Md., 500 tons. We quote beams and channels up to 15 in. at 1.10c. to 1.15c., f. o. b. Pittsburgh, the lower price for desirable orders.

Plates.—The only important inquiry for steel cars is from the Northern Pacific, for 116 passenger cars. The general demand for plates is dull, with no indication of early improvement. Some mills are running only two days per week, owing to the light demand. We quote ¼-in. and heavier plates at 1.10c., f.o.b. Pittsburgh, and on a very desirable order this might be shaded.

Rods.—Foreign inquiry for rods has quieted down, and domestic demand is also dull. We note one sale of 200 tons for shipment to England and a reported sale of 500 tons of open-hearth rods, also for export. We quote Bessemer, open-hearth and chain rods at $25.50 to $26, Pittsburgh.

Skelp.—Inquiry for grooved and sheared steel skelp is still coming from abroad, but no sales of moment have been made for some time. The pipe mills have few orders on their books, and are not buying skelp in the open market. We quote: Grooved steel skelp, 1.10c. to 1.15c.; sheared steel skelp, 1.15c. to 1.20c.; grooved iron skelp, 1.45c. to 1.50c.; sheared iron skelp, 1.50c. to 1.60c., delivered to consumers' mills in the Pittsburgh district.

Iron and Steel Bars.—New inquiry for both iron and steel bars continues quiet, and mills report satisfactory specifications. None of the bar iron mills is running to more than 40 to 50 per cent. of capacity. We quote steel bars at 1.10c. to 1.15c. for delivery this month and in December, while for first quarter the makers are quoting 1.20c. We quote common iron bars at 1.15c. to 1.20c., f.o.b. Pittsburgh.

Sheets.—The new demand for sheets is dull and only for small lots. Specifications against contracts are falling off. Operations of mills are on a lower basis than for some time. Several of the leading makers state they are still holding No. 28 black sheets at 2c., and No. 28 galvanized at 3c., but a few are shading these prices at least $2 per ton. We quote No. 28 Bessemer black sheets at 1.90c. to 2c.; No. 28 galvanized, 2.90c. to 3c.; Nos. 9 and 10 blue annealed sheets, 1.40c. to 1.45c. The above prices are for carload and larger lots, jobbers charging the usual advances for small lots from store.

Tin Plate.—The trade in tin plate is falling off and mill operations are being cut down. As yet none of the makers has announced prices on contracts for 1915 delivery. There is little new demand, as the season is over. We quote 100-lb. 14 x 20 coke plates at $3.15 to $3.25 per box, and 100-lb. 14 x 20 terne plates at $3.10 to $3.20 per box, f.o.b. Pittsburgh.

Wire Products.—Foreign inquiry for wire and wire nails continues active, coming mostly from England and South America, but some is from India, Spain, Canary Islands and elsewhere. The greater part of this demand is for barb wire. The large amount of foreign business taken has served to fill the mills here to a considerable extent, and stocks of barb wire at the mills are light. The domestic demand for wire and wire nails is dull, and on recent orders the $1.60 price on wire nails has been shaded 5c. per keg. We quote wire nails at $1.60; plain annealed wire, $1.40; galvanized barb wire and fence staples, $2; painted barb wire, $1.60, all f.o.b. Pittsburgh, freight added to point of delivery, terms 30 days net, less 2 per cent. off for cash in 10 days. We quote steel cut nails at $1.60 to $1.65, f.o.b. Pittsburgh, in carload lots. We quote woven wire fencing at 73 per cent. off in carload lots, 72 on 1000-rod lots and 71 on smaller lots, all f.o.b. Pittsburgh.

Shafting.—Specifications against contracts from the automobile builders are falling off. As yet but little business in shafting has been specified for by the implement makers, while this should be their busy season. The new demand is only for small lots for prompt shipment. We quote cold-rolled shafting at 66 to 67 per cent. off, depending on the order, delivered in base territory.

Hoops and Bands.—The new demand is only for small lots to cover current needs. Specifications against contracts are not active. We quote steel bands at 1.15c., with extras as per the steel bar card, but it is reported that this price has been shaded about $1 per ton. We quote steel hoops at 1.25c., f.o.b. Pittsburgh.

Railroad Spikes.—No improvement is seen. Specifications from railroads on contracts are not coming in freely. Several makers have operated their plants on an average of two to three days per week for several months. We quote standard sizes of railroad and boat spikes at $1.40 and small railroad and boat spikes at $1.50 per 100 lb. in carload lots, f.o.b. Pittsburgh.

Nuts, Bolts and Rivets.—Only small lots are being sold. Several makers of nuts and bolts have stocks which they are anxious to move and are naming low prices. Rivets are dull, especially boiler rivets. We quote structural rivets at 1.45c. and boiler rivets at 1.55c. in carload lots, small lots taking an advance of about 10c. Discounts on nuts and bolts are as follows in lots of 300 lb. or over, delivered within a 20c. freight radius of maker's works:

Coach and lag screws	80 and 5% off
Small carriage bolts, cut threads	80% off
Small carriage bolts, rolled threads	80 and 5% off
Large carriage bolts	75 and 5% off
Small machine bolts, cut threads	80 and 5% off
Small machine bolts, rolled threads	80 and 10% off
Large machine bolts	75 and 10% off
Machine bolts, c.p.c. & t nuts, small	80% off
Machine bolts, c.p.c. & t nuts, large	75 and 5% off
Square h.p. nuts, blank and tapped	$6.30 off list
Hexagon nuts	$7.20 off list
C.P.C. and r sq. nuts, blank and tapped	$6.00 off list
Hexagon nuts, ⅝ in. and larger	$7.20 off list
Hexagon nuts, smaller than ½ in.	$7.80 off list
C.P. plain square nuts	$5.50 off list
C.P. plain hexagon nuts	$5.90 off list
Semi-fin. hex. nuts, ½ in. or under	85, 10 & 10% off
Semi-fin. hex. nuts, ⅝ in. and larger	85 & 5% off
Rivets, 7/16 x 6½, smaller & shorter	80, 10 & 5% off
Rivets, tin plated, packages	80, 10 and 5% off
Rivets, metallic tinned, packages	80, 10 and 5% off
Standard cap screws	70, 10 and 10% off
Standard set-screws	75, 10 and 10% off

Merchant Steel.—While it was expected that the demand by this time for seasonable steels would be fairly active, this has not been realized. Jobbers' stocks are low, as mills can fill orders promptly. Prices depend on the size of the order and deliveries wanted, but on small lots for prompt shipment are about as follows: Iron finished tire, ½ x 1½ in. and larger, 1.30c., base; under ½ x 1½ in., 1.45c.; planished tire, 1.50c.; channel tire, ¾ to ⅞ and 1 in., 1.80c. to 1.90c.; 1⅛ in. and larger, 1.90c.; toe calk, 1.90c. to 2c., base; flat sleigh shoe, 1.65c.; concave and convex, 1.70c.; cutter shoe, tapered or bent, 2.20c. to 2.30c.; spring steel, 1.90c. to 2c.; machinery steel, smooth finish, 1.70c. We quote cold-rolled strip steel as follows: Base rates for 1 in. and 1½ in. and wider, under 0.20 carbon, and No. 10 and heavier, hard temper, 3.25c.; soft, 3.50c.; coils, hard, 3.15c.; soft, 3.40c.; freight allowed. The usual differentials apply for lighter sizes.

Standard Pipe.—Effective November 2, discounts on standard steel pipe were increased one point. Ordinarily this would mean a reduction of $2 per ton, but recently the National Tube Company reduced extreme discounts to jobbers from 5 and 2½ per cent. to 5 per cent. off, so that the increase in discounts now made is equivalent to a reduction of about $1. The discount on 13 to 15 in. lap-weld black steel pipe under the old card of April 20, 1914, was 53 per cent., but it had not been observed for a long time, going as low as 65 and 5 for plain ends. Under the new card the discount on 13 and 14 in. has been put at 63½ per cent. and 15 in. at 61. Several mills report orders entered in October as slightly larger than in September, while others had an opposite experience. The Dayton Pipe Coupling Company, Dayton, Ohio, of which D. O. Holbrook is local sales manager, will furnish the couplings for the 60 miles of 6, 8, 10 and 12 in. line pipe taken recently by the National Tube Company for shipment to Waco, Texas. The current demand for iron and steel pipe is not over 30 to 40 per cent. of the mill capacity.

Boiler Tubes.—Little is being done in locomotive or merchant tubes and prices depend wholly on the order and deliveries wanted.

Coke.—There has been a further material restriction in output. In the past week or 10 days fully 2500 ovens have been put out. No new demand has come out for coke, and prices are largely nominal. We quote standard makes of blast-furnace coke for spot shipment at $1.60 per net ton at oven, but some good grades are being offered at $1.50, or lower. Standard 72-hr. foundry coke is held at about $2 per net ton at oven, but some grades are being offered as low as $1.85 at oven. The Connellsville Courier reports the output of coke in the upper and lower Connellsville regions for the week ended October 24 as 229,519 tons, a decrease over the previous week of about 8210 tons.

Old Material.—The market is stagnant and prices have shown a further decline. Consumers are not in the market. The only sales being made are between dealers to fill existing contracts. For delivery to consumers' mills in the Pittsburgh and other consuming districts that take Pittsburgh freights, dealers quote about as follows:

Heavy steel melting scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen, Midland and Pittsburgh delivery	$10.00 to	$10.25
Compressed side and end sheet scrap	9.00 to	9.25
No. 1 foundry cast	10.50 to	10.75
Bundled sheet scrap, f.o.b. consumers' mills, Pittsburgh district	8.00 to	8.25
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	11.75 to	12.00
No. 1 railroad malleable stock	10.00 to	10.25
Railroad grate bars	9.00 to	9.25
Low phosphorus melting stock	13.00 to	13.25
Iron car axles	18.75 to	19.25
Steel car axles	13.25 to	13.75
Locomotive axles, steel	19.75 to	20.25
No. 1 busheling scrap	9.00 to	9.25
No. 2 busheling scrap	6.00 to	6.25
Machine shop turnings	7.50 to	7.75
Old carwheels	11.00 to	11.25
Cast-iron borings	8.00 to	8.25
*Sheet bar crop ends	10.50 to	10.75
Old iron rails	12.75 to	13.00
No. 1 railroad wrought scrap	10.75 to	11.00
Heavy steel axle turnings	8.25 to	8.50
Heavy breakable cast scrap	10.25 to	10.50

*Shipping point.

The Chamber of Commerce of Cincinnati, Ohio, announces that L. B. Holt, recently appointed as a commercial agent in Mexico by the Department of Commerce, will spend November 17 and 18 visiting different manufacturing plants in Cincinnati and its environs. He will leave for Mexico at an early date and is endeavoring to get in touch with American exporters to that country before his departure.

S. DIESCHER & SONS.
Mechanical and Civil Engineers,
PITTSBURGH, PA.

Chicago

CHICAGO, ILL., November 3, 1914.

The pig-iron trade is practically the only department of the market in which the downward tendency seems to have been checked. It is probable that October records the smallest tonnage in pig-iron sales since November, 1907, but inquiry for next year and sales recently consummated promise a better showing for the current month. In the marketing of steel products no significant change appears. The amount of projected work now held up for financial reasons is the basis for considerable hope that the new banking system with its financial relief will bring a release of much desirable business. Railroad inquiries for bridge steel and track fastenings for spring delivery are noted in increased numbers. Local structural plate and bar mills continue their intermittent operations, with practically 65 per cent. of capacity continuously idle. The scrap market is this week featured by the offering of over 30,000 tons of old material from the railroads. The absorption of this scrap without still further radical concessions in price seems impossible.

Pig Iron.—Melters are showing a more active interest in their requirements for the first half of next year. A natural effort is being made to place tonnage for that delivery at the low prices now being quoted for prompt shipment. Furnaces are not yet willing to concede as much, particularly for what tonnage is in sight, and accordingly negotiations are proceeding in most instances quite slowly. An inquiry for 2000 tons of malleable for a Chicago foundry is perhaps the most conspicuous in point of tonnage. The public opening of quotations for the 500 tons of Northern and 500 tons of Southern iron to be purchased for the Chicago municipal foundry revealed but two bidders. An award has not yet been made. Steel companies' furnaces in this district continue to command prompt shipment business with the attractive quotations they appear willing to make. The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable Bessemer and basic iron, which are f.o.b. furnace and do not include a local switching charge averaging 50c. a ton:

Lake Superior charcoal	$15.75 to $16.75
Northern coke foundry, No. 1	13.25 to 13.75
Northern coke foundry, No. 2	12.75 to 13.25
Northern coke foundry, No. 3	12.75 to 13.25
Southern coke, No. 1 f'dry and 1 soft	14.50 to 14.75
Southern coke, No. 2 f'dry and 2 soft	14.00 to 14.25
Malleable Bessemer	13.00 to 13.50
Standard Bessemer	15.50
Basic	12.50 to 13.00
Low phosphorus	20.00 to 20.50
Jackson Co. and Ky. silvery, 6 per cent.	16.90 to 17.40
Jackson Co. and Ky. silvery, 8 per cent.	17.90 to 18.40
Jackson Co. and Ky. sil'vy, 10 per cent.	18.90 to 19.40

Rails and Track Supplies.—Beyond an increased inquiry for track fastenings, principally for spring delivery, the railroads have been but unimportant factors during the week. A few specifications for rails in small lots are reported, but there is nothing of consequence under negotiation. Additional sales of tie plates, but for insignificant tonnages, have been made by local mills. We quote standard railroad spikes at 1.50c. to 1.60c., base; track bolts with square nuts, 1.90c. to 2c., base, all in carload lots, Chicago; tie plates, $25 to $27, f.o.b. mill, net ton; standard section Bessemer rails, Chicago, 1.25c., base; open hearth, 1.34c.; light rails, 25 to 45 lb., 1.25c.; 16 to 20 lb., 1.30c.; 12 lb., 1.35c.; 8 lb., 1.40c.; angle bars, 1.50c., Chicago.

Structural Material.—Lettings of fabricated structural steel throughout the West as reported last week total little more than 700 tons, of which the largest item was 304 tons for a highway bridge in Wisconsin, placed with the Worden-Allen Company. It is also reported that this company will furnish 200 tons for the Johnson Soap Company's factory. Western structural mills are operating only part of the time and such schedules as are in force are possible only by virtue of some tonnage rolled for stock. Open quotations give but little indication of what might be done for attractive business. We continue to quote for Chicago delivery of plain shapes from mill 1.28c.

We quote for Chicago delivery of structural material from store 1.75c.

Plates.—One of the local plate mills that was idle last week is this week operating on single turn while accumulated orders last. No tonnage of consequence is appearing. There is inquiry for a miscellaneous assortment of cars mostly for passenger service, the largest of which comes from the Northern Pacific. Some of the railroads are figuring on their bridge work for the coming year and some plate tonnage is under negotiation for this purpose. We quote for Chicago delivery of plates from mill 1.28c.

We quote for Chicago delivery of plates from store 1.75c.

Sheets.—The falling off in new business is indicated by the operation this week of only 10 out of 18 mills of one of the principal producers, following a long continued run at full capacity. The list of consumers of sheets whose requirements have gradually diminished grows steadily. The tendencies toward weakness in price are now established reductions. We quote for Chicago delivery from mill: No. 10 blue annealed, 1.58c.; No. 28 black, 2.08c. to 2.18c.; No. 28 galvanized, 3.08c. to 3.18c.

We quote for Chicago delivery from jobbers' stocks as follows, minimum prices applying on bundles of 25 or more: No. 10 blue annealed, 1.95c.; No. 28 black, 2.55c.; No. 28 galvanized, 3.55c.

Bars.—Steel and iron bar mills in this district alike hover close to the border line of complete idleness. Specifications for steel bars are so few and of such limited tonnages as to make it an open question whether the mills might not be better off without them. Reinforcing bars, for which ordinarily there is a brisk demand at this season, are almost entirely neglected. Except for mention of the very limited business and the exceptionally low prices, there is nothing to be said concerning bar iron. We quote for mill shipments as follows: Bar iron, 0.97½c. to 1.05c.; soft steel bars, 1.33c. to 1.38c.; hard steel bars, 1.25c. to 1.30c.; shafting in carloads, 65 per cent. off; less than carloads, 60 per cent. off.

We quote store prices for Chicago delivery: Soft steel bars, 1.65c.; bar iron, 1.65c.; reinforcing bars, 1.65c. base, with 5c. extra for twisting in sizes ½ in. and over and usual card extras for smaller sizes; shafting 60 per cent. off.

Rivets and Bolts.—Orders continue scattering and of widely diversified specifications. Prices are almost equally irregular. We continue to quote from mill as follows: Carriage bolts up to ⅜ x 6 in., rolled thread, 85; cut thread, 80-5; larger sizes, 80; machine bolts up to ¾ x 4 in., rolled thread, 85-5; cut thread, 85; larger sizes, 80-5; coach screws, 85-10; hot pressed nuts, square head, $6.60 off per cwt.; hexagon, $7.60 off per cwt. Structural rivets, ¾ to 1¼ in., 1.58c., base, Chicago, in carload lots; boiler rivets, 10c. additional.

We quote out of store: Structural rivets, 2.20c.; boiler rivets, 2.30c.; machine bolts up to ¾ x 4 in., 75-15; larger sizes, 70-10-10; carriage bolts up to ⅜ x 6 in., 75-10; larger sizes, 70-15 off; hot pressed nuts, square head, $6, and hexagon, $6.70 off per cwt.

Wire Products.—The trade presents somewhat better appearances because of more favorable mill bookings from unusual sources. We quote to jobbers as follows: Plain wire, No. 9 and coarser, base, $1.58; wire nails, $1.78; painted barb wire, $1.78; galvanized, $2.18; polished staples, $1.78; galvanized, $2.18, all Chicago.

Cast-Iron Pipe.—The placing of 200 tons with the leading interest for delivery at Ashton, Ill., is the only transaction of note. At Duluth the quantity on a pending contract is to be increased 300 tons, and at Springfield, Ohio, a like amount is to be offered for bids November 13. We quote as follows, per net ton, Chicago: Water pipe, 4 in., $26; 6 to 12 in., $24; 16 in. and up, $23.50, with $1 extra for gas pipe.

Old Material.—The volume of trade is steadily shrinking. There seems to be no bottom for prices, and quotations again show declines. A further sagging of values also seems inevitable in view of the very heavy offerings during the past week from railroads. The Baltimore & Ohio is asking quotations on 15,000 tons, including 4000 tons of steel rails; the Pennsylvania has a list of about 5000 tons; the Chicago & Northwestern 6300 tons, including 1500 tons rails, 600 tons angle bars and 600 tons wrought scrap. The Wabash asks tenders

on some 2500 tons of rail now in track, while other small lists bring the aggregate close up to 33,000 tons. We quote for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton

Old iron rails	$11.00 to $11.25
Old steel rails, rerolling	9.50 to 10.00
Old steel rails, less than 3 ft.	9.25 to 9.50
Old carwheels	10.50 to 11.00
Heavy melting steel scrap	8.50 to 8.75
Frogs, switches and guards, cut apart	8.50 to 8.75
Shoveling steel	8.00 to 8.25
Steel axle turnings	6.50 to 7.00

Per Net Ton

Iron angles and splice bars	$10.75 to $11.25
Iron arch bars and transoms	10.50 to 11.00
Steel angle bars	7.50 to 8.00
Iron car axles	13.75 to 14.25
Steel car axles	10.50 to 11.00
No. 1 railroad wrought	7.75 to 8.00
No. 2 railroad wrought	7.25 to 7.50
Cut forge	7.25 to 7.50
Steel knuckles and couplers	8.25 to 8.75
Steel springs	9.25 to 9.50
Locomotive tires, smooth	8.75 to 9.25
Machine shop turnings	4.75 to 5.00
Cast borings	4.75 to 5.00
No. 1 busheling	6.50 to 6.75
No. 2 busheling	5.50 to 5.75
No. 1 boilers, cut to sheets and rings	5.00 to 5.50
Boiler punchings	8.75 to 9.25
No. 1 cast scrap	8.75 to 9.00
Stove plate and light cast scrap	8.00 to 8.25
Grate bars	7.75 to 8.00
Railroad malleable	7.75 to 8.00
Agricultural malleable	7.25 to 7.50
Pipes and flues	5.50 to 5.75

Philadelphia

PHILADELPHIA, PA., November 3, 1914.

While some steel men say that actual conditions as experienced by them are worse than they had been, because of a greater weakness in the prices obtainable, and the volume of orders shows no betterment, there is, nevertheless, a more confident feeling as to the future. The better sentiment is not based on indications peculiar to the iron and steel industry but on governmental reports on matters of widespread trade importance, such as the growth of exports which are turning the balance of trade in favor of the United States, a better money situation, the approaching opening of the Federal Reserve banks, the freer movement of cotton and like developments. In pig iron business continues to drag and interest is chiefly in a new project already in motion to make standard low phosphorus iron on the Delaware River. Bars and structural material hold their price level, but plates are weak. Open-hearth billets are lower. Sheets continue quiet and the price is shaded for heavy buyers. Old material is lifeless.

Iron Ore.—Arrivals of foreign ore at this port in the week ended October 31 were light. The only importation reported by the customs authorities was 6000 tons from Spain.

Pig Iron.—The only item of unusual interest is the appearance of a Delaware River steel company as a maker of standard low phosphorus pig iron. It is understood that sales already have been made to a nearby wire manufacturer and to a steel mill, and at a substantial discount from the prevailing quotation of $20.50 to $21 for standard low phosphorus. In the week sales have been made at $20.50 and $20.75, delivered, by the usual sellers of standard analysis iron, while the makers of Lebanon low phosphorus say their price of $17.50, furnace, is unchanged. The new factor in the local field is using El Cuero ore from Cuba, the analysis of which, according to one authority, shows that it contains in its natural state 61.23 per cent. of iron and 0.009 phosphorus. Of the ore 30,000 tons is immediately available. The making of standard low phosphorus iron in Chester was not unexpected as the advantages, both as to deliveries at the furnace of raw materials and the ease with which deliveries can be made to the neighboring steel foundries, have been realized. Charges for transportation by rail are eliminated in the case of the first and very largely so in the case of the second. The general run of iron buying continues to be of the hand-to-mouth, prompt shipment variety which is indicative of the meager stocks in founders' yards. Opportunities to book these small lots are pursued with energy and they are invariably taken at low prices. A seller of Virginia iron took orders for only 300 tons last week, but found that the total of shipments in October was the best of the past few months. Through a local office a sale of 300 tons of No. 3 Southern iron was made to a Southern pipe works. Quotations for standard brands for early delivery in buyers' yards in this district are as follows:

Eastern Penna. No. 2 X foundry	$14.50 to $14.75
Eastern Penna. No. 2 plain	14.25 to 14.50
Virginia No. 2 X foundry	15.25
Virginia No. 2 plain	15.00
Gray forge	13.50 to 13.75
Basic	14.00
Standard low phosphorus	20.50 to 21.00

Ferroalloys.—Dealers in ferromanganese state their quotation to be unchanged at $68, but it is intimated that resales have been made, some for export, at a lower figure. Ferrosilicon of the 50 per cent. grade is unchanged at $71 to $73, according to quantity.

Bars.—The market has been quiet, there being, however, one inquiry for between 500 and 600 tons of steel bars which is now considered as of good size. The quotation is 1.15c. to 1.20c., Pittsburgh base, or 1.30c. to 1.35c., Philadelphia, according to quantity. Iron bars are without feature at 1.12c., Philadelphia.

Plates.—More weakness has been shown by plates than by other finished materials and desirable business can be done easily at 1.25c., Philadelphia, though small, miscellaneous lots command 1.30c. Even with those mills which have fared the best, business is irregular, as might be expected when locomotive and car building is almost nil.

Structural Material.—No new propositions requiring material are reported in this territory and the market continues to drag, with 1.30c., Philadelphia, the uncertain quotation. Two Pennsylvania Railroad bridges at Wilkinsburg, Pa., have been placed, the larger one going to the McClintic-Marshall Company and the other to an eastern Pennsylvania steel company, the two jobs requiring about 1000 tons. The McClintic-Marshall Company also received an order for 750 tons for a wharf at Bilboa and the Belmont Iron Works got 250 tons for a wharf shed for the same place. The contract for the new shop of the Pen Argyl shops of the Lehigh & New England Railroad Company is still open.

Billets.—Business by which the actual level of the market could be determined is lacking, but higher than $21.40, Philadelphia, could hardly be obtained for open-hearth rolling billets in view of the quotation in other producing centers. Forging steel commands $4 more.

Sheets.—For carload lots, 1.55c., Philadelphia, is quoted for No. 10 blue annealed, but heavy buyers can get it at 1.50c. The demand has continued to ease off.

Old Material.—While general conditions are poor, there is an underlying feeling of optimism that a betterment will soon come. Recent arrivals at this port have overstocked the market. Quotations, already low, are unchanged. They are as follows for delivery in buyers' yards in this district covering eastern Pennsylvania and taking freight rates from 35c. to $1.35 per gross ton:

No. 1 heavy melting steel	$9.50 to $10.00
Old steel rails, rerolling	11.50 to 12.00
Low phosphorus heavy melting steel scrap	13.50 to 14.00
Old steel axles	13.00 to 13.50
Old iron axles	17.50 to 18.00
Old iron rails	13.00 to 14.00
Old carwheels	9.50 to 10.00
No. 1 railroad wrought	11.50 to 12.00
Wrought-iron pipe	9.50 to 10.00
No. 1 forge fire	8.00 to 8.50
Bundled sheets	8.00 to 8.50
No. 2 busheling	7.75 to 8.25
Machine shop turnings	7.50 to 8.00
Cast borings	7.50 to 8.00
No. 1 cast	11.00 to 12.00
Grate bars, railroad	8.00 to 8.50
Stove plate	8.00 to 8.50
Railroad malleable	9.00 to 9.50

Coke.—There has been no break in the quiet and uninteresting conditions of recent weeks. The mini-

mum quoted for prompt furnace coke is $1.60 per net ton at oven. Prompt foundry ranges from $2.15 to $2.50. There is but little disposition to enter contracts. Freight rates to this city from the principal producing districts are as follows: Connellsville, $2.05; Latrobe, $1.85, and Mountain, $1.65.

Buffalo

BUFFALO, November 3, 1914.

Pig Iron.—Considerably more iron was sold from this district the past week than was reported for the previous week but at slightly lower prices. It is stated that a good sized tonnage of low silicon iron was booked by a western New York furnace at $12 at furnace, although no definite details are procurable. Considerable increase in sales for delivery to territory outside the regular district is also noted. The total for Buffalo and western New York furnaces to local and outside district consumers aggregates about 35,000 tons of all grades, according to a producer in a position to speak authoritatively. The transactions have not as yet been followed by any appreciation in price. Prices now range between $12 and $12.50 for all grades, with some furnace interests asking more; but the differentials between the various grades are so slight that a well defined schedule cannot be quoted. We approximate, however, with an average reduction of 25c. per ton for fourth quarter delivery, f.o.b. furnace:

No. 1 foundry	$12.50 to $12.75
No. 2 X foundry	12.00 to 12.50
No. 2 plain	12.00 to 12.50
No. 3 foundry	12.00 to 12.50
Gray forge	12.00 to 12.50
Malleable	12.25 to 12.50
Basic	13.25 to 13.75
Charcoal, regular grades and analysis	16.25 to 17.25
Charcoal, special grades and analysis	20.50

Finished Iron and Steel.—Specifications and orders are coming out in a hand-to-mouth fashion. Prices have settled to 1.15c., base, on bars and shapes, with a possibility of 1.10c. on desirable specifications for plates, all for immediate shipment. Agencies and mills in this district appear to have receded from their attitude of last week regarding the acceptance of contracts for next year's delivery, the present policy being not to enter into contracts at this time for delivery extending into next year. On tin plate and sheets buyers are commencing to sound the market for next season's contracts; but in these lines also mills are averse, under current conditions, to quote for such deliveries. Canadian business is quiet with plants of consumers of bars and shapes operating in many instances at less than 50 per cent. of capacity. In fabricated structural lines the indications are that investors are again beginning to look into building projects. The Lackawanna Bridge Company has the contract for about 500 tons for additional factory buildings for the New Process Gear Corporation, Syracuse. C. H. Everitt, Buffalo, is low bidder for Troop I Armory, this city, requiring 300 tons. Bids go in November 10 for Erie barge canal contract No. 3 for 400 tons of bridge work.

Old Material.—The week has been very dull. We quote without charge dealers' selling prices as follows per gross ton, f.o.b. Buffalo:

Heavy melting steel	$9.00 to $9.50
Low phosphorus steel	12.50 to 13.00
No. 1 railroad wrought scrap	9.50 to 10.00
No. 1 railroad and machinery cast	9.75 to 10.25
Old steel axles	11.50 to 12.00
Old iron axles	17.00 to 17.50
Old carwheels	10.00 to 10.50
Railroad malleable	9.00 to 9.50
Machine shop turnings	5.25 to 5.75
Heavy axle turnings	7.50 to 8.25
Clean cast borings	5.75 to 6.25
Old iron rails	11.25 to 11.50
Locomotive grate bars	8.50 to 9.00
Stove plate (net ton)	8.50 to 9.00
Wrought pipe	6.50 to 7.00
Bundled sheet scrap	6.25 to 6.50
No. 1 busheling scrap	7.25 to 7.75
No. 2 busheling scrap	5.00 to 5.50
Bundled tin scrap	10.50

The Erie Iron & Steel Company, Twentieth and Ash streets, Erie, Pa., has been formed to deal in old material, with officers as follows: B. A. Zacks, president; J. H. Zacks, treasurer; Henry L. Zacks, secretary.

Cleveland

CLEVELAND, OHIO, November 3, 1914.

Iron Ore.—The Pittsburgh Steamship Company loaded its last ore cargoes to-day and will send its boats to winter quarters about the end of the week, or as soon as their loads are discharged at Lake Erie ports. Some firms cleared up shipments last week and others will forward a few cargoes during the next few days. It is expected that the last shipments will be made by November 15. We quote prices as follows: Old range Bessemer, $3.75; Mesaba Bessemer, $3.50; old range non-Bessemer, $3.00; Mesaba non-Bessemer, $2.85.

Pig Iron.—Efforts by some Southern producers to stir an interest in the market have brought out a number of inquiries for foundry iron for delivery after January 1, consumers stating that they might buy if prices were satisfactory. The market is not firm and Southern iron can now be bought for delivery through the entire first half at $10, Birmingham. Shipments of considerable Southern iron have been held up. Northern foundry iron is extremely dull, although some inquiry has come out for small lots for the first quarter. No. 2 foundry is quoted at $12.75, Cleveland, for outside shipment. A local steel plant, which ordinarily consumes all of its pig iron, has for disposal an excess output of basic. The sale of 500 tons of low phosphorus iron is reported in Milwaukee, and there is another inquiry from the same city for about 400 tons. Prices on low phosphorus iron are lower. We quote, delivered Cleveland, as follows:

Bessemer	$14.70
Basic	13.45
Northern No. 2 foundry	$13.50 to 13.75
Southern No. 2 foundry	14.00
Gray forge	13.25
Jackson Co. silvery, 8 per cent. silicon	17.62
Standard low phos., Valley furnace	20.00

Finished Iron and Steel.—Although the demand in most lines is dull, an improvement is noted in various steel specialties. Prices on steel bars are not firm. Some business has been taken at 1.10c., Pittsburgh, although mills are generally holding to 1.15c. for the small orders coming out. Plate prices are 1.10c. to 1.15c., and structural material is generally quoted at the latter price. An Ohio mill has taken an order for about 600 tons black sheets for shipment to South Africa, and considerable new inquiry has come from England. The demand for sheets for building purposes in October was much less than normal, owing to the absence of orders from the South. Mahoning Valley sheet mills are running at about 70 per cent. of their capacity. Prices are fairly well maintained. Wire mills are running at a better rate, owing to the good foreign orders, particularly for barb wire, the mills of the leading maker being operated at about 70 to 75 per cent. of their capacity. The Toledo Bridge & Crane Company has taken 1000 tons of steel for a bridge in Chattanooga. New bids have been received for the Lindner Building, Cleveland, owing to a change in the plans, which increased the amount of steel required to 1200 tons. An order has been placed for 500 tons of I-beams to be used in the Hanover Street bridge at Baltimore, and another order is for 380 tons of structural material required for a car dumper in Toledo. Bar iron continues dull, with prices unchanged at 1.15c. to 1.20c., Cleveland. Warehouse prices are 1.80c. for steel bars and 1.90c. for plates and structural material.

Bolts, Nuts and Rivets.—Bolt and nut makers report an improved demand, more business coming from the implement makers. October showed a fair gain over September. Prices are still somewhat irregular. There is little new demand for rivets, with prices unchanged at 1.45c. to 1.50c. for structural and 1.55c. to 1.60c. for boiler rivets. We quote discounts as follows: Common carriage bolts, ⅝ x 6 in., smaller or shorter, rolled thread, 80 and 20 per cent.; cut thread, 80 and 15 per cent.; larger or longer, 75 and 15 per cent.; machine bolts with h. p. nuts, ⅝ x 4 in., smaller or shorter, rolled thread, 80 and 25 per cent.; cut thread, 80 and 20 per cent.; larger or longer, 80 per cent.; coach and lag screws, 80 and 25 per cent.; square h. p. nuts, blank or tapped, $6.30 off; hexagon h. p. nuts, blank or tapped, $7.20 off; c. p. c. and t. square nuts, blank or tapped,

$6 off; hexagon, ⅝ in. and larger, $7.20 off; 9/16 in. and smaller, $7.80 off; semi-finished hexagon nuts, ⅝ in. and larger, 85, 10 and 5 per cent.; 9/16 in. and smaller, 85, 10, 10 and 5 per cent.

Old Material.—The decline in prices has stopped and a better feeling has developed among producers, many of whom are now inclined to hold for an advance. Dealers now complain that they cannot cover at present prices. However, material on cars that must be moved is going at low rates. Nothing in the demand indicates an improvement. Sales are few and little material is being taken on contract. Both local steel plants are holding back on shipments. The Pennsylvania Lines West and the Wheeling & Lake Erie will close on their scrap lists November 5 and the Baltimore & Ohio November 9. We quote, f.o.b. Cleveland, as follows:

Per Gross Ton

Old steel rails, rerolling	$11.00 to $11.75
Old iron rails	12.00
Steel car axles	11.75 to 12.00
Heavy melting steel	8.75 to 9.25
Old carwheels	10.75 to 11.00
Relaying rails, 50 lb. and over	23.00 to 25.00
Agricultural malleable	8.50 to 9.00
Railroad malleable	9.50 to 10.00
Light bundled sheet scrap	7.50 to 8.00

Per Net Ton

Iron car axles	$16.75 to $17.00
Cast borings	5.50 to 5.75
Iron and steel turnings and drillings	5.00 to 5.25
Steel axle turnings	6.00 to 6.25
No. 1 busheling, new	8.00 to 8.25
No. 1 busheling, old	7.75 to 8.00
No. 1 railroad wrought	9.50 to 10.00
No. 1 cast	9.75 to 10.00
Stove plate	7.50

Cincinnati

CINCINNATI, OHIO, November 4, 1914.—(*By Wire.*)

Pig Iron.—The opening of furnace books for first-quarter delivery has brought out a number of orders, mostly for limited tonnages. A few local melters bought quantities of Southern iron ranging from a carload to 300 tons at $10, Birmingham basis. Very little Northern foundry has been sold, as the price of $13, Ironton, is prohibitive compared with Southern. Several jobbing foundries in this vicinity are operating to full capacity, principally on orders from machine-tool makers. The stove foundries are only doing fairly well, as the mild weather has adversely affected their business. More interest is being taken in silvery irons, and one sale of 900 tons was made to a northern Ohio melter at the prevailing price with delivery through the first quarter. Basic is also waking up, although consumption now is at a very low mark. One inquiry is out for 10,000 tons for first half. No improvement in the malleable situation is expected until the railroads begin to buy equipment and supplies. Based on freight rates of $2.90 from Birmingham and $1.26 from Ironton, we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 f'dry and 1 soft	$13.40 to $13.90
Southern coke, No. 2 f'dry and 2 soft	12.90 to 13.45
Southern coke, No. 3 foundry	12.40 to 12.90
Southern No. 4 foundry	11.90 to 12.40
Southern gray forge	11.40 to 11.90
Ohio silvery, 8 per cent. silicon	17.20 to 17.70
Southern Ohio coke, No. 1	15.26 to 15.76
Southern Ohio coke, No. 2	14.26 to 14.76
Southern Ohio coke, No. 3	14.01 to 14.26
Southern Ohio malleable Bessemer	14.26
Basic, Northern	14.51 to 15.01
Lake Superior charcoal	15.25 to 17.25
Standard Southern carwheel	26.90 to 27.40

(*By Mail*)

Coke.—A few foundries in this vicinity have bought some coke for prompt shipment, but there does not seem any movement toward contracting for a future supply. Prices are weak. On Connellsville 48-hr. coke as low as $1.50 per net ton at oven has been done on coke loaded on cars ready for shipment.

Finished Material.—Little new business has developed the past week. The call for reinforcing concrete bars has slumped somewhat. There is no demand for hoops or bands. The sheet mills are still feeling the effects of the dull situation in the South, but are holding No. 28 black at 2.15c., Cincinnati, or Newport, Ky., and No. 28 galvanized at 3.15c. Although mill prices on steel bars have been shaded, local store quotations are unchanged at 1.80c. to 1.85c.

Old Material.—A few foundries having contracts with machine-tool builders now busy on export business have bought small tonnages of scrap iron, but not enough to affect the prevailing quotations. The large users of old material are the rolling mills, who are consuming less than half the usual tonnage. The minimum figures given below represent what buyers are willing to pay for delivery in their yards, southern Ohio and Cincinnati, and the maximum quotations are dealers' prices f.o.b. at yards:

Per Gross Ton

Bundled sheet scrap	$6.00 to $6.50
Old iron rails	10.75 to 11.25
Relaying rails, 50 lb. and up	19.50 to 20.00
Rerolling steel rails	9.75 to 10.25
Melting steel rails	8.50 to 9.00
Old carwheels	9.50 to 10.00
Heavy melting steel	8.25 to 8.75

Per Net Ton

No. 1 railroad wrought	$7.75 to $8.25
Cast borings	3.75 to 4.25
Steel turnings	3.75 to 4.25
Railroad cast scrap	9.00 to 9.50
No. 1 machinery cast scrap	9.75 to 10.25
Burnt scrap	5.75 to 6.25
Old iron axles	14.25 to 14.75
Locomotive tires (smooth inside)	9.00 to 9.50
Pipes and flues	5.75 to 6.25
Malleable and steel scrap	6.75 to 7.25
Railroad tank and sheet scrap	4.75 to 5.25

New railroad tariffs issued, effective October 26, advance southern Ohio rates to all Central Association territory 5 per cent., making the rate from Ironton to Cincinnati $1.26. Northern roads have agreed to protect the present rate of $2.90 from Birmingham to Oakley, Addyston and other Cincinnati points not originally included in the first tariff.

Birmingham

BIRMINGHAM, ALA., November 2, 1914.

Pig Iron.—A few inquiries for 1915 delivery have produced no results. Trading is still at a minimum and the condition is being met by blowing out furnaces. The Sloss-Sheffield Steel and Iron Company will blow out two stacks this week, one at Sheffield and one in Birmingham, reducing its active capacity to two stacks. President Maben of this company reports an accumulation of 142,000 tons and October sales under the make of one stack. Similar reports come from other makers. The inquiry from Japan for a large tonnage did not mature. The active business on the export side appears to be in billets and barb wire. On the maiden trip of the first Mobile-San Francisco ship, leaving Mobile November 15, 1000 tons of special pig iron and some cast-iron pipe will be among the consignments, both going at a ship rate of $6 per ton. We quote, per gross ton, f.o.b. Birmingham district furnaces, for rest of the year and first quarter of 1915, the last figure representing special iron, as follows:

No. 1 foundry and soft	$10.50 to $10.75
No. 2 foundry and soft	10.00 to 10.25
No. 3 foundry	9.50 to 9.75
No. 4 foundry	9.25 to 9.50
Gray forge	9.00 to 9.25
Basic	10.00 to 10.25
Charcoal	23.50 to 24.00

Cast-Iron Pipe.—The larger pipe concerns report a number of orders, principally from far Western cities, where financial conditions appear to be best at this time. Operations are not above a 70 per cent. basis. The American Cast Iron Pipe & Foundry Company denies receiving a Texas contract reported as having been first awarded to R. D. Wood & Co. Sanitary pipe shops report a dull period. We quote, per net ton, f.o.b. pipe shop yards, as follows: 4-in., $20; 6-in. and upward, $18, with $1 added for gas pipe. These quotations are sometimes shaded on attractive propositions.

Coal and Coke.—The bunker coal trade is improving slightly. Steam coal is still a third off in demand and output. The Pratt Consolidated Coal Company is building a set of barges and tow boats at Holt, Ala., in preparation for entering the all-water trade to Mobile via the Warrior River on the completion of lock 17, which is scheduled early in 1915. Coke production has been still further decreased. We quote, per net ton,

f.o.b. oven, as follows: Furnace coke, $2.75 to $2.90; foundry, $3.15 to $3.30.

Old Material.—The market is as dull as it has ever been and dealers are slow to take on stocks. We quote, nominally, per gross ton, f.o.b. dealers' yards, as follows:

Old iron axles	$13.00 to $13.50
Old steel axles	12.50 to 13.00
Old iron rails	12.00 to 12.50
No. 1 railroad wrought	8.50 to 9.00
No. 2 railroad wrought	7.50 to 8.00
No. 1 country wrought	8.00 to 8.50
No. 2 country wrought	7.00 to 7.50
No. 1 machinery cast	9.50 to 10.00
No. 1 steel scrap	8.00 to 8.50
Tram carwheels	8.50 to 9.00
Stove plate	8.00 to 8.50

St. Louis

ST. LOUIS, MO., November 2, 1914.

Pig Iron.—Evidence is that foundries will direct their efforts to limit purchases to the quantities necessary to carry them beyond the first of the year and at the same time assure themselves against an advance over present prices. Sales of the week included one lot of 300 tons of 8 per cent. silicon and 200 tons of No. 2 Southern foundry. One inquiry, the largest in several weeks, is for 1200 tons for a stove concern divided between Northern and Southern Nos. 2 and 3 foundry. Prices are, perhaps, a little weaker with an increasing number of furnaces willing to contract for first quarter at present prices.

Coke.—The 2000-ton inquiry is still unplaced and likely to remain so, at least until the weather becomes more severe, as it is chiefly for fuel purposes. By-product coke is not moving and $5 or less, St. Louis, is about the present figure.

Finished Iron and Steel.—There is a rather spotted demand, one day being especially dull and the next active, but on the whole it is very light. The agricultural implement people are operating on half time or less and the wagon trade is entirely out of the market, as most of the product of this section goes to the cotton country. Movement of stock out of warehouse continues light. We quote for stock out of warehouse as follows: Soft steel bars, 1.70c.; iron bars, 1.65c.; structural material, 1.80c.; tank plates, 1.80c.; No. 2 blue annealed, cold rolled, 2c.; No. 28 black sheets, 2.55c.; No. 28 galvanized black sheet gauge, 3.55c.

Old Material.—Only exceptionally attractive lots are being taken to unload in the yards and these always at the dealers' own price. The only list out this week so far is one of 300 tons from the Vandalia. We quote dealers' prices, with the reservation that transactions are always governed by the needs of buyer and seller at the moment, f.o.b. St. Louis

Per Gross Ton

Old iron rails	$10.50 to $10.75
Old steel rails, rerolling	10.75 to 11.00
Old steel rails, less than 3 ft	10.00 to 10.25
Relaying rails, standard section, subject to inspection	21.00 to 23.00
Old carwheels	10.50 to 10.75
No. 1 railroad heavy melting steel scrap	9.50 to 9.75
Shoveling steel	7.50 to 8.00
Frogs, switches and guards, cut apart	9.50 to 9.75
Bundled sheet scrap	4.50 to 4.75

Per Net Ton

Iron angle bars	$9.50 to $10.00
Steel angle bars	8.25 to 8.50
Iron car axles	16.25 to 16.75
Steel car axles	11.25 to 11.75
Wrought arch bars and transoms	10.50 to 11.00
No. 1 railroad wrought	7.50 to 7.75
No. 2 railroad wrought	7.50 to 7.75
Railroad springs	8.75 to 9.00
Steel couplers and knuckles	8.25 to 8.75
Locomotive tires, 42 in. and over, smooth	8.25 to 8.75
No. 1 dealers' forge	7.25 to 7.75
Mixed borings	3.50 to 3.75
No. 1 busheling	6.75 to 7.00
No. 1 boilers, cut to sheets and rings	5.25 to 5.75
No. 1 cast scrap	9.00 to 9.50
Stove plate and light cast scrap	7.75 to 8.25
Railroad malleable	7.50 to 7.75
Agricultural malleable	7.00 to 7.50
Pipes and flues	5.25 to 5.75
Railroad sheet and tank scrap	5.25 to 5.50
Railroad grate bars	6.75 to 7.00
Machine shop turnings	4.50 to 4.75

San Francisco

SAN FRANCISCO, CAL., October 27, 1914.

The recent brisk demand in certain lines has fallen off, but the consuming demand for miscellaneous steel products in the small trade appears to be holding its own fairly well. Some of the leading merchants report nearly a normal tonnage, though at the low jobbing prices now prevailing the values involved are below the average. On the other hand, large business is conspicuously absent, and virtually no new business is going to the Eastern mills. The general report among local mill agents is that they have seldom seen business as dull. Mill prices have weakened slightly in some lines, and the local market has been unsettled by a cut in the Panama Canal rate to 25c. per 100 lb. on bars, shapes and plates, though the 30c. rate still holds on sheets and pipe.

Bars.—The principal feature is the entrance of a new manufacturing interest into this market. The Judson Mfg. Company, which formerly rolled common iron bars, has made arrangements with the West Coast Iron Company, this city, for a supply of open-hearth steel ingots and is offering steel bars to the trade at a price considerably below that of the leading interest on jobbers' carloads from store, which is 1.85c. The West Coast Iron Company's plant has been making about 40 tons of ingots daily for a short time, but is temporarily closed for repairs. The small jobbing trade is fair, with a general quotation of 2.10c. There is still some foreign material to arrive, and there seems to be no anxiety as to its safety. There have been a good many small orders for reinforcing material, but the principal local mill operating on this material is running at about half capacity.

Structural Material.—Business has not improved, being limited almost entirely to work of an insignificant nature, and even that is not plentiful. Several of the local shops are practically idle, and under the present freight rates Eastern fabricators find considerable difficulty in getting business here. Dyer Bros., the largest local fabricators, are adding a new storage shed and crane to their shop, but are using only a few columns and roof trusses. Plans are well advanced for the University of California hospital, to cost $600,000, but it is expected that bids will not be taken for some time.

Plates.—With old tank contracts gradually being completed, and scarcely any new work of importance coming out, business is duller than for many months.

Sheets.—The season of heaviest demand for corrugated sheets has passed, and merchants are again confining their purchases to the narrowest possible limits. Some buying is said to have been done for delivery next year. The city of San Diego has placed a good-sized contract with the Western Pipe & Steel Company, Los Angeles, for riveted sheet pipe, but aside from this there is very little movement in blue annealed or black sheets.

Standard Pipe.—Local representatives of the leading interest say they have never seen the pipe business so dull nor the outlook for the future so dark as at present; and this view is, in a general way, confirmed in other quarters.

Cast-Iron Pipe.—While important business is still lacking, there are more inquiries than for some time, and the outlook for the near future is considered somewhat better. An order has been placed for 300 tons for the Philippine Islands, and purchases have been made by several small towns in this vicinity.

Pig Iron.—Melting requirements continue light, and the market is weak. Arrivals have more than kept pace with the consumption of late, as numerous shipments have come in on sailing vessels from English and European ports, and frequent shipments of Calcutta iron are arriving by the Pacific Mail line. From present indications, supplies from this source will not be interrupted. Large melters, who are supplied on contracts, have a considerable surplus, and are very glad to meet the hand-to-mouth requirements of the smaller interests. There is also considerable stock in

importers' hands, which is not moving, and quite a large tonnage of Chinese iron, formerly held by the Western Steel Corporation of Seattle, still remains, covering the needs of a local steel mill. With Panama Canal service shortly to include Mobile and New Orleans, it will be possible to land No. 1 Southern foundry iron here, based on present Birmingham quotations, at about $19.50 per gross ton. Local interests, however, are now taking no interest whatever in forward shipments from any quarter.

Coke.—Several shipments of German Syndicate coke have arrived lately, and there is a considerable tonnage still afloat. Requirements are lighter than usual, and it is estimated in some quarters that there is enough here and on the way to last six months. There is accordingly little interest in offerings from domestic sources.

Old Material.—The general consuming demand for all classes of scrap is confined to narrow limits, as outside buyers are entirely out of the market, and few local melters are operating on a normal scale. Steel melting scrap is moving in a limited way, principally on old contracts, at an average price of about $8 per gross ton, and foundries are getting small lots of cast-iron scrap at $14.50 to $15 per net ton. Wrought scrap receives but little attention.

New York

NEW YORK, November 4, 1914.

Pig Iron.—A stove foundry in Jersey City has bought iron for the first quarter of 1915, the amount being estimated at 1000 tons. Buffalo furnaces took this business. One or two other tonnages for delivery after the first of the year are pending in New Jersey. The Lackawanna Railroad has bought 520 tons for delivery at Scranton, Pa. Some further buying is reported in New England, but it is on a small scale, foundries apparently expecting to do business for the first quarter at the lowest prices recently reported or lower. Buffalo sales at $12 at furnace for No. 2 X have been made in territory ordinarily reached by eastern Pennsylvania furnaces and the latter seem to be at their limit in the effort to compete. We quote Northern iron for tidewater delivery as follows: No. 1 foundry, $14.25 to $14.75; No. 2 X, $14 to $14.25; No. 2 plain, $13.75 to $14. Southern iron is quoted at $14.50 to $14.75 for No. 1 and $14.25 to $14.50 for No. 2.

Ferroalloys.—The market for 80 per cent. ferromanganese is as quiet as it was just preceding the war. While there have been a few domestic inquiries in the past week, no sales have been made and the quotation stands at $68, seaboard. Inquiries for export are still appearing but without definite result. Unconfirmed rumors are to the effect that some sales were made but price and destination were not available. Small lots of 50 per cent. ferrosilicon are being sold at the prevailing quotations of $71 to $73, Pittsburgh, according to the quantity.

Finished Iron and Steel.—A short week, owing to local elections, has not helped in bookings, and the leanness, which has actually been so great as to make some business men go back 40 years to find a parallel, is accentuated by increased signs of price weakness. More is heard of Eastern mills quoting on a basis of their own mills, making cuts of 40c. from the ton price on the Pittsburgh basing. The suprising weakness comes in plates for export, in spite of greater strength now likely in the British steel market. Some export prices appear to have been made at $2 per ton under domestic quotations. Less fresh proposals for structural work have appeared than for any time on the present depressed movement and it is now literally true that car builders have no freight car offerings regarded as likely to develop into orders; the only activity remains with passenger car equipment, but considerable general car buying for foreign countries is expected though not necessarily in the early future. In the structural field 2700 tons for a loft building, Thirty-fifth street and Broadway, is said to be closed and the Eastern Steel Company has the 1000 tons for the Colony Club, incorrectly reported last week. The American Bridge Company has taken 409 tons for the New Haven and 500 tons for the Pennsylvania railroad at Wilkinsburg, Pa., and about 100 tons has been closed for the Women's Hospital, New York. One other building, in addition to those recently mentioned in this column, likely soon to be let, is the Niles commercial building, School street, Boston, 400 tons. We quote mill shipments of steel bars and shapes at 1.15c. to 1.20c., Pittsburgh, or 1.31c. to 1.36c., New York; steel plates at 1.10c. to 1.15c., Pittsburgh, or 1.26c. to 1.31c., New York, and iron bars at 1.25c., New York. For lots from store we quote iron and steel bars at 1.80c. to 1.85c., New York, and plate and structural material at 1.85c. to 1.90c.

Cast-Iron Pipe.—The city of Troy, N. Y., will open bids Friday, November 6, on about 1400 tons of 30-in. water pipe. No other lettings of importance are announced. The situation as to prices is unchanged. Carload lots of 6-in. are available at about $20 to $20.50 per net ton, tidewater.

Old Material.—A sale of 1000 tons of heavy melting steel scrap at $9.25, delivered eastern Pennsylvania, indicates the direction in which scrap prices are traveling. Consumers are either showing no interest in the market or make offers much below the views of holders. The best price that can now be obtained for heavy melting steel scrap in eastern Pennsylvania is about $9. Almost nothing is being done in rolling-mill stock, while foundries are endeavoring to purchase cast scrap at heavy concessions. The outlook continues discouraging. The supply of old material is steadily increasing. Vessels loaded with scrap are coming to Atlantic ports from Panama, Cuba and other West Indian sources and they are arriving at an exceedingly bad time for the disposal of such cargoes as railroad lists are heavy and consumers' mills and shops are far from busy, requiring less scrap than in any time for months. It seems inevitable that considerably lower prices must be realized. Dealers' quotations are as follows, per gross ton, New York:

Old girder and T rails for melting	$7.00 to	$7.25
Heavy melting steel scrap	7.00 to	7.25
Relaying rails	19.00 to	19.50
Rerolling rails	8.00 to	8.25
Iron car axles	14.00 to	14.25
Steel car axles	10.00 to	10.50
No. 1 railroad wrought	8.50 to	9.00
Wrought-iron track scrap	8.00 to	8.50
No. 1 yard wrought, long	8.00 to	8.50
No. 1 yard wrought, short	7.00 to	7.25
Cast borings	5.50 to	6.00
Wrought turnings	5.00 to	5.50
Wrought pipe	7.00 to	7.25
Carwheels	8.50 to	9.00
No. 1 heavy cast, broken up	9.50 to	10.00
Stove plate	7.25 to	7.50
Locomotive grate bars	6.00 to	6.50
Malleable cast	6.50 to	7.00

Boston

BOSTON, MASS., November 3, 1914.

Old Material.—The dealers state that business has fallen off to practically nothing. Prices continue nominal. The quotations given below are based on prices offered by the large dealers to the producers and to the small dealers and collectors, per gross ton, carload lots, f.o.b. Boston and other New England points which take Boston rates from eastern Pennsylvania points. Mill prices are approximately 50c. per ton higher.

Heavy melting steel	$7.00 to	$7.75
Low phosphorus steel	13.75 to	14.75
Old steel axles	12.75 to	13.25
Old iron axles	20.25 to	20.75
Mixed shafting	12.00 to	12.25
No. 1 wrought and soft steel	8.25 to	8.75
Skeleton (bundled)	5.50 to	5.75
Wrought-iron pipe	7.00 to	7.50
Cotton ties (bundled)	5.25 to	5.75
No. 2 light	3.25 to	3.75
Wrought turnings	5.00 to	5.50
Cast borings	5.00 to	5.25
Machinery cast	10.75 to	11.00
Malleable	7.50 to	7.75
Stove plate	7.00 to	7.50
Grate bars	5.25 to	5.50

The Pittsburgh Valve, Foundry & Construction Company, Pittsburgh, recently shipped 15 cast-steel valves to the Anglo-Mexican Oil Company in Mexico. The order was secured by its New York office and prompt delivery was made.

British Steel Trade Poor

Home Makers' Prices on Semi-Finished Cheaper Than American—Pig Iron Steady

(*By Cable*)

LONDON, ENGLAND, November 4, 1914.

Pig iron is very slow. Home export makers want orders, but prices keep wonderfully steady considering everything. Hematite pig shows weakness and ore is falling. Nothing is being done in ferromanganese, which is quoted at £12 ($58.39). Furnaces in blast are 160, against 187 last year. Stocks of pig iron in Connal's stores are 104,991 tons, against 107,725 last week. Semi-finished steel is easy but British prices are cheaper than American, though the latter seem more inclined to cut in. It is impossible to trace any serious business yet. The demand for finished steel is poor and prices are easing down continually, while American independents are more anxious for business. Tinplates are rather steadier, mainly on the tin position and a big line of quarters for the East was sold at 13s. ($3.16). Such quotations as are available are as follows:

Tin plates, coke 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 12s. 7½d. ($3.07).

Cleveland pig-iron warrants (Tuesday), 49s. 2½d. ($11.97), against 49s. 3d. ($11.98) last week.

No. 3 Cleveland pig iron, makers' price, f.o.b. Middlesbrough, 49s. 9d. ($12.10), against 50s. ($12.17) last week.

Steel black sheets, No. 28, export, f.o.b. Liverpool, £8 15s. ($42.58), against £8 17s. 6d. ($43.19) last week.

Steel ship plates, Scotch, delivered local yards, £6 15s. ($32.84).

Steel rails, export, f.o.b. works port, £6 2s. 6d. ($29.80).

'Hematite pig iron, f.o.b. Tees, 62s. ($15.09), against 63s. ($15.33) last week.

Sheet bars (Welsh), delivered at works in Swansea Valley, £4 15s. ($23.12).

Steel joists, 15 in., export, f.o.b. Hull or Grimsby, £6 7s. 6d. ($31.02), against £6 10s. ($31.62) last week.

Steel bars, export, f.o.b. Clyde, £7 ($34.06).

Metal Market

NEW YORK, November 4, 1914.

The Week's Prices

Cents Per Pound for Early Delivery

	Copper, New York			Lead		Spelter	
Oct.	Lake	Electrolytic	Tin, New York	New York	St. Louis	New York	St. Louis
28	11.50	11.25	30.45	3.50	3.37½	5.10	4.95
29	11.50	11.25	30.50	3.50	3.37½	5.10	4.95
30	11.50	11.25	30.80	3.50	3.37½	5.10	4.95
31	11.50	11.25	31.10	3.50	3.37½	5.10	4.95
Nov. 2	11.50	11.25	31.80	3.50	3.37½	5.05	4.90

Copper is quiet at unchanged quotations. Tin is higher and greater strength is indicated. Lead is firm after considerable activity. Spelter is quiet and weaker. Antimony is in lighter demand, but prices are maintained.

New York

Copper.—Following the excellent business of about 10 days ago the market has been quiet, with such sales as have been made on the basis of 11.25c., cash, New York, or 11.37½c., 30 days, delivered. Some of the producers are holding for 11.50c., 30 days, delivered, as they have been doing for several weeks, but little or no business has been booked at this figure. Lake is nominal at 11.50c. to 11.75c., cash. Exports are being restrained by complications arising over the action of England in seizing shipments of metal en route to neutral countries. Two Italian ships which were so held up have been released after negotiations, but the Kroonland with a large shipment aboard is understood to be detained at Gibraltar. The situation has led to a formal protest being lodged with the Washington Government by American producers. An effect of the attitude of England has been a refusal on the part of some steamship lines to refuse acceptance of copper shipments, all of which tends to weaken the market. Daily statistics of exports are now unavailable since the Secretary of the Treasury ordered customs collectors not to give out the figures until they are 30 days old. The exports from Atlantic ports in October totaled 23,414 tons. The figures for ten months of this year are good, the decrease being but 9435 tons as compared with the same time last year, when 322,399 tons was exported.

Copper Averages.—The Waterbury average for the month of October was 12.25c. The average New York price for Lake, based on daily quotation in *The Iron Age*, was 11.73½c., and for electrolytic, 11.39c.

Tin.—At times the market has been fairly active and because of the buying, and indications that there may be a shortage of the metal, prices have advanced, the quotation on Monday being 31.80c. Apprehension that supplies might prove inadequate developed in the latter part of last week. It was pointed out that shipments from the East in October amounted to 3785 tons, 850 tons of which was lost when the steamer Trolius was sunk, so that the total available shipment was really less than 3000 tons. On the other hand, there was delivered into domestic consumption in October 3700 tons, 2500 tons of which came through Atlantic ports and 1200 tons from the Pacific coast. Realization of the situation came to a head on October 30 and a good bit of activity ensued, between 300 and 500 tons being dealt in on that day. A good business was done November 2, also, and more could have been done had sellers been willing to let go. On October 29 prices varied greatly, 30.25c. being quoted early in the day and 30.75c. at a late hour. In stocks and landing October 31 was 1146 tons. This month 25 tons has arrived. Figures as to the amount of metal which is afloat on unknown steamers is not obtainable, but there is 640 tons aboard vessels due to arrive in the first half of this month.

Lead.—Since the last report there has been a continuance of good business, the sales running into thousands of tons for domestic and foreign account. This has caused a strong market. The lowest price is now that of the large interest, 3.50c., New York. Independent sellers are quoting 3.37½c., St. Louis.

Spelter.—Buying has tapered off and the market is weaker at 5.05c. to 5.10c., New York, and 4.90c. to 4.95c., St. Louis. In October exports from New York and Philadelphia amounted to 6175 tons, of which 4454 tons went to England.

Antimony.—Cookson's can be had at 16c., Hallett's at 15c. and other grades at 13.50c. to 14c., although some holders are asking as much as 18c. for Cookson's, 17c. for Hallett's and 15c. for other brands. The market has turned quiet.

Old Metals.—The market shows no improvement. Dealers' selling prices are nominally unchanged as follows:

	Cents per lb.
Copper, heavy and crucible	11.00 to 11.25
Copper, heavy and wire	10.75 to 11.00
Copper, light and bottoms	9.75 to 10.00
Brass, heavy	8.25 to 8.50
Brass, light	6.25 to 6.50
Heavy machine composition	10.50 to 10.75
Clean brass turnings	7.50 to 7.75
Composition turnings	9.25 to 9.50
Lead, heavy	3.25
Lead, tea	3.00
Zinc scrap	3.50

Chicago

NOVEMBER 2.—Except antimony, which advanced sharply, prices have changed but little. We quote as follows: Casting copper, 11.75c.; Lake copper, 12c., for prompt shipment; small lots, ⅛c. to ¼c. higher; pig tin, carloads, 32.50c.; small lots, 35c.; lead, desilverized, 3.42½c. to 3.47½c., and corroding, 3.75c., for 50-ton lots; in carloads, 2½c. per 100 lb. higher; spelter 4.90c. to 4.95c.; Cookson's antimony, 20c. for cask lots; other grades, 16c. On old metals we quote buying prices for less than carload lots as follows: Copper wire, crucible shapes, 10c.; copper bottoms, 8.50c.; copper clips, 9.50c.; red brass, 9c.; yellow brass,

6.50c.; lead pipe, 3.10c.; zinc, 3.50c.; pewter, No. 1, 22c.; tinfoil, 25c.; block tin pipe, 27c.

St. Louis

NOVEMBER 2.—There have been considerable sales of both lead and spelter and prices are somewhat better. Quotations to-day are: Lead, 3.37½c.; spelter, 4.92½c. to 4.95c.; tin, 33c.; Lake copper, 13c.; electrolytic copper, 12.90c.; Cookson's antimony, 18c. In the Joplin zinc ore market all grades brought better prices. Lead ore was rather dull. Miscellaneous scrap metals are quoted as follows: Light brass, 5c.; heavy yellow brass, 7c.; heavy red brass and light copper, 8c.; heavy copper and copper wire, 9c.; zinc, 3c.; lead, 3c.; tea lead, 3c.; pewter, 20c.; tinfoil, 24c.

Iron and Industrial Stocks

NEW YORK, November 4, 1914.

Although nothing definite has yet developed regarding the re-opening of the New York Stock Exchange, financial conditions are so steadily improving that the way is rapidly being cleared for such action. The banks belonging to the New York Clearing House added heavily to their surplus in the past week and now make a showing of about $15,000,000 above legal requirements, which is a higher amount than in the corresponding week of any year since 1908. Specie holdings (nearly all gold) are now $20,000,000 above those of a year ago this week and $33,500,000 above the week of the war panic ended August 8. A spirit of reviving confidence has characterized the entire week, following a mood of profound dejection and despondency in the financial community. Contributing to this improved sentiment was the entrance of Europe into our market as a heavy purchaser of supplies, with arrangements for the creation in this country of large credit balances for the account of foreign governments. This will greatly assist in restoring exchange to its normal condition.

Dividends

The Inland Steel Company, 1 per cent., payable December 1. This is a reduction of ¾ of 1 per cent. from the declaration three months ago.

The Eastern Steel Company has deferred action on the regular quarterly, 1¾ per cent., on the first preferred stock.

The Cleveland-Cliffs Iron Company, Cleveland, has passed its quarterly dividend of 2½ per cent.

The Dominion Bridge Company, regular quarterly, 1¼ per cent., payable November 16.

The Pressed Steel Car Company, regular quarterly, 1¾ per cent., on the preferred stock, payable November 25, and ¾ of 1 per cent. on the common stock, payable December 16.

The Ontario Steel Products Company has deferred the dividend of 1 per cent. on its preferred stock.

At a recent meeting of the stockholders of the Southwark Foundry Machine Company, Philadelphia, the following officers were elected: W. L. Abbott, president; Edward T. Childs, vice-president and sales manager; A. C. Vauclain, second vice-president; B. A. Phillips, secretary and treasurer. Mr. Abbott was formerly associated with the United Engineering & Foundry Company, Pittsburgh, and Mr. Vauclain with the Baldwin Locomotive Works, Philadelphia.

At the bi-monthly meeting of the structural section of the Engineers' Society of Western Pennsylvania, held in its rooms in the Oliver Building, Pittsburgh, on Monday evening, November 2, R. A. Pendergrass, McClintic-Marshall Company, read a paper on "Construction Details of the Lock Gates at the Panama Canal."

The Farrar Smoke Eliminator Company, Erie, Pa., capitalized at $10,000, has been incorporated by James W. Farrar and others, and arrangements for a manufacturing plant are being made.

CORRESPONDENCE

Some Catalogue Suggestions for South America

To the Editor: I was interested in Mr. Crain's remarks under the heading of "Some Catalogue Suggestions," in the issue of *The Iron Age*, of July 30. As head of the engineering section of a large merchant house in South America, perhaps a few suggestions on the subject of catalogues may be acceptable.

As a market for engineering goods, we have the Nitrate Oficinas, and, as your readers are no doubt aware, this is the best market for machinery in the whole of South America. It is necessary for us to have at hand a large supply of catalogues of machinery of every description, and, as these at present amount to over a thousand, they must be very carefully filed.

We have adopted the vertical filing system and use several of the Library Bureau cabinets. The catalogues are put into folders, which are in numerical order, and for reference to them, we use a card index. This has two compartments, one of which is for the names of the manufacturers and the other for the name of the articles. These are filed alphabetically. Space is allowed on the cards to note down special discounts, etc. This system works very well and any catalogue can be found immediately. The advantage of the folders is that one can file therein the various letters from the manufacturers regarding new products, prices, etc.

As to the method the American manufacturer uses in preparing and sending out catalogues, he is far behind his British and German competitor. With the exception of some of the larger concerns, the average manufacturer has not the slightest idea of preparing a catalogue for the export trade. Very little direct business is done with South America. The bulk of the business is done by large importing houses who have a special department for each branch and have offices in New York and London. Owing to the variety of work which falls their way, they have no time for catalogues that are not complete with prices f.o.b. New York, shipping weights, measurements and discounts.

By every mail we receive quantities of catalogues and other printed matter from the United States. Some of these are beautifully prepared, but the bulk of them go into the waste paper basket. Why? Because a large number of manufacturers have a notion that we want to see photographs of themselves, their sons, secretaries, treasurers, etc. A large amount of space is also devoted to views of the factory and in telling the impatient reader the number of acres it covers and that it is the largest in the world in that line.

We are not at all interested in this. What we want to know is "the article and the price." To get at the latter, it should be shown f.o.b. New York. Some manufacturers put their prices f.o.b. factory. How do people down here know the distance from the factory to New York, or the freight rates! Another will forget to put in the shipping weights and measurements of the machinery *boxed for export*. This should be given; also the net and gross weights in kilograms and pounds. Then we can work out the shipping freights to the various ports and also the amount of duty to be paid, discharge from the ship and cartage to our warehouse, or railroad freight to the interior.

Discounts are also frequently omitted. I would advise manufacturers to save the postage on all the miscellaneous odd leaflets which are sent out broadcast by every mail. They seem to forget that this is not the United States. Conditions are entirely different.

Catalogues in duplicate and printed in Spanish should be sent to the importing houses. These should be complete with prices and other details to enable them to work out a price on the goods. Otherwise, how can they compare it with what they are paying for the European article?

Another important point is: Do not turn down inquiries because something is asked for which is not standard. Recently I had an opportunity of placing an order for a large pumping windmill with a 50-ft.

tower and a 40-ft. wheel, to be similar to one in the same district which had been at work for nine years and is still going strong. I sent the inquiry to both England and the United States, telling exactly what I wanted. By return mail from England, I received a blue print, specification and a price, c.i.f., Chilean port for the mill as I asked for it. From the United States I received several quotations from concerns offering their standard article, which proved not to be according to the particulars I sent and useless for the job in question. Consequently the order went to England and the price was over £150 ($730) more than that quoted for an American standard article.

But I only intended to write you concerning catalogues. In conclusion, therefore, I am of the opinion that until manufacturers organize a central bureau for giving advice and preparing catalogues for the export trade, they will waste huge sums of money each year in unfruitful propaganda work. Better still, let several manufacturers get together and send down a traveler who is a technical man and who can speak the language. The market is well worth it in certain lines.

T. N. CHAMBERS.

Williamson, Balfour & Co.,
Antofagasta, Chile, September 7, 1914.

Germany's Trade Position Due to Technical Men

To the Editor: It is amusing to read newspaper comment on the great opportunities of this country. I refer to European conditions and the absolute certainty in the minds of many people of the speedy downfall of "poor," but alas! powerful Germany. All sorts of good things are going to come our way when the poor Teuton is crushed. The dream of capturing most of his trade is now uppermost in the mind of many manufacturers. Why should this great country have to be dependent on Germany for so many manufacturing essentials? Why cannot we make those things at home? We have brains, raw material and unlimited resources, and now is the time to do it.

Of course, by the time this war is over there will be nothing left of German energy, and German trade will be gone. It will have been captured by us (and the English) and we are then going to continue the German progress in the world! It has perhaps never dawned on the people who talk thus that the Germans have built up their magnificent trade by the aid of technical men, and that their trade is maintained and pushed forward still more by the aid of such men. The technical man is to Germany, figuratively speaking, "the man behind the gun," as far as her manufacturing and commerce are concerned.

There is no danger of our capturing the trade of Germany as long as the technical man is kept in the background. This country is far, far from the realization of such a dream. After the war—beaten or not—the Germans will be more aggressive than ever.

In Germany, as a rule, no position of responsibility is given to a non-technical man. Even salesmen are more or less technical. I speak now of manufacturing. The path to the position of superintendent and general manager is trod only by the technical man; hence the success of German trade.

The capture of German business by America is going to happen only when the technical man is given his right place. At present there are no signs of the American manufacturer being broad-minded enough to see that his opportunities will not come until he gives the technical man not only obscure existence in drawing rooms and laboratories as now, but appoints them superintendents and general managers as well.

BIRGER F. BURMAN.

Pittsburgh, October 26, 1914.

Turbo-Blowers

To the Editor: Referring to the report of the recent American Institute of Mining Engineers meeting in Pittsburgh, made in your issue of October 15, I would like to correct any misunderstanding which may exist regarding my remarks:

The packing rings in the turbo-blowers do not wear out as they do in centrifugal pumps. In the case of one turbo-compressor these rings, after an 8-yr. run, were found to be fully as tight as when the compressor was started.

Only a few turbo-blowers are in operation in Germany on blast furnaces because, for special reasons, the gas-engine-driven blower has the preference there, but apparently there is a trend to install steam-driven turbo-blowers as a reserve in the gas-engine power houses. On the other side the turbo-compressor is coming more and more in use, especially for large units.

OTTO BANNER,
Chief engineer turbine department,
Ingersoll-Rand Company.

Phillipsburg, N. J., October 27, 1914.

Judicial Decisions

ABSTRACTED BY A. L. H. STREET

DAMAGES FOR BREACH OF CONTRACT TO SELL.—Damages recoverable for breach of contract to sell a commercial commodity which has a market value are properly measured by the excess of the market value of the goods at the contract time and place of delivery above the agreed price. (Oklahoma Supreme Court, W. H. Coyle Consol. Cos. vs. Swift & Co., 141 Pacific Reporter 1114.)

DUTY TO SAFEGUARD MACHINERY.—The requirement under the Pennsylvania factory act that employers guard dangerous machines does not make employers insurers of the safety of their workers while operating machines, and there is no obligation to install a guard which will destroy the efficiency of the particular machine to which it is to be applied. (Pennsylvania Supreme Court, Wagner vs. Standard Sanitary Mfg. Company, 91 Atlantic Reporter 353.)

WHEN BUYER MAY REFUSE TO RECEIVE MACHINERY.—Under a contract to sell machinery f.o.b. cars point of shipment, to be paid for one-fourth within 30 days after the buyer's receipt of the machinery, and the balance in equal installments, at four, eight and twelve months, evidenced by notes of even date with the bill of lading, the buyer was not bound to receive machinery shipped under a bill of lading taken to the seller's own order, and forwarded to a bank in a town other than that where the buyer was engaged in business and where the machinery was shipped, with instructions not to deliver the bill of lading until notes should be executed for the full purchase price. (Ohio Supreme Court, Petersburg Fire Brick & Tile Company vs. American Clay Machinery Company, 106 Northeastern Reporter 33.)

COMBINATION OF DEVICES AS PATENTABLE INVENTION.—A device is patentable if it produces a new result in a new way, although it be formed by a combination of old devices. (United States District Court, Eastern District of New York, G. M. J. Murphy Company vs. Metal Stamping Company, 214 Federal Reporter 382.)

The Diamond Forging & Mfg. Company, North Side, Pittsburgh, has bought the ground on which its plant is located. This includes two parcels, one 140 x 210 ft., and the other 90 x 140 ft. The company is making additions to its plant, consisting of a steel structural drop forge shop, 90 x 140 ft.; a brick machine shop, 30 x 100 ft., and departments for electro-galvanizing and nickel, brass and copper plating. It will then have the only drop forging plant in the Pittsburgh district. The equipment will comprise six board drop hammers, ranging from 600 to 2000 lb. each. The company makes automobile, machinery and wagon drop forgings. The business was established in a small way some years ago and has steadily grown, the additions noted being made to meet the expanding requirements of the trade. All equipment for the additions has been purchased.

The W. H. Singer Estate, Pittsburgh, will build a four-story laboratory for the Allegheny General Hospital in that city. Janssen & Abbott, Century Building, Pittsburgh, have the plans

Iron and Steel Institute at Birmingham

(Continued from page 1077)

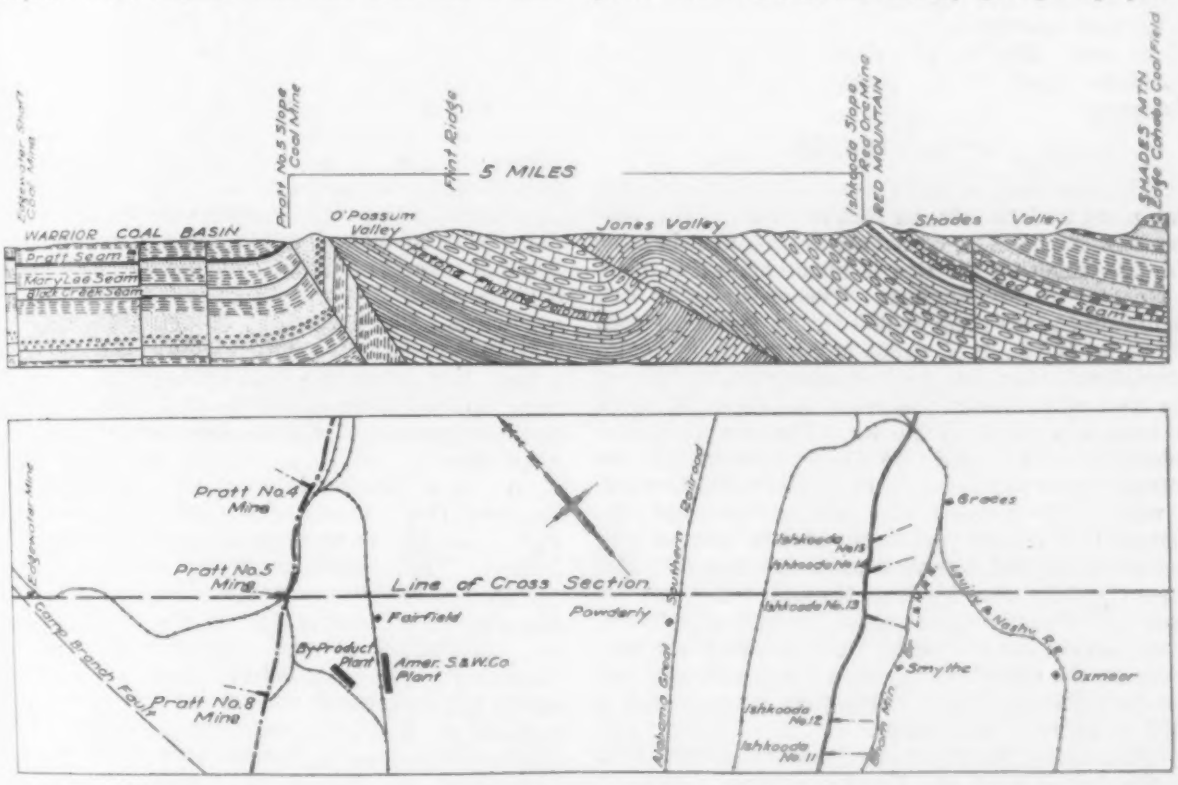
200,000 in Greater Birmingham. The stake of the South in export trade was referred to and the statement made that its export of cotton alone last year was twice the value of the total exports of iron and steel from the United States. Mr. Farrell said further:

The facilities offered under the federal reserve act in permitting discount privileges to foreign paper and the establishment abroad of branches of national banks will redound to the advantage of the domestic and export interests of the South, as one of the few difficulties still remaining to be overcome in the extension of foreign trade is the question of finance and credit. The South is more largely concerned with respect to our foreign commerce than any other section of the country, due to the necessity of keeping open its foreign avenues of commerce for its cotton, lumber, phosphate rock, sulphur, iron and steel and a hundred other commodities. The canal has opened wide the doors of opportunity for the South to the possibilities on the western coast of South America and Central America, and also to our western States and British Columbia.

In considering this position of the South as a factor in the commerce of the world, many members of this Institute will naturally think in terms of profound sympathy for our brethren in the European steel industry now engaged in what seems to us, in view of our former close friendship with them and theirs with each other, a fratricidal struggle. The great calamity of this war and its evil effect upon ourselves in common with every other nation of the world is made almost personal to us in contemplation of what it means to the steel industry of Europe and our friends in that industry, who by their visits to this country and our visits to them have cemented the ties of friendship for many years.

The first three months of this war, which all of us hope will not be greatly prolonged, have demonstrated that we are confronted by conditions never before imagined, and that it is necessary to consider new methods of conducting business along lines in which there has been, in our lifetime, no precedent. That chaotic business conditions resulted immediately from such a cataclysm of destruction of property, of financial stress, of the dislocation of the world's commerce, has not been surprising; that the United States has not suffered more, that we have been enabled to maintain confidence in the stability of our institutions and in the ultimate recovery to normal conditions is a matter of congratulation.

That buying in many lines has been contracted to cover only immediate needs has perhaps been natural, but if reports from numerous centers of consumption may be credited, many warehouses are comparatively bare of supplies, retrenchment has been overdone, and with the cordial co-operation of the various departments of the government in devising measures to assist in financing the cotton crop and providing suitable financial machinery, with the influx of demand for materials for foreign consumption, many of which have never before been exported in such large quantities from this country; with the exercise of the ingenuity of our people in manufacturing for our own consumption articles heretofore imported from abroad and thereby giving employment in new lines of industry, it may be not only reasonably hoped but expected with assurance that with the beginning of a new year with the settlement of all these vexatious and onerous difficulties, a new era of expanding business will dawn.



Geological Cross-Section of a Portion of the Birmingham District Covered by the American Iron and Steel Institute Excursion

Mr. King expressed sympathy with the business men of the South in the losses due to the unprecedented cotton situation and sounded a note of hope from measures now under way.

Excursions of Friday and Saturday

A special train left the Louisville & Nashville depot 9.15 Friday morning and by 4.30 in the afternoon had made a 50-mile swing to the west and southwest of the city, taking in typical mining and iron-making operations. The Tennessee Coal, Iron & Railroad Company's management of this and the excursion of the following day was in line with the handling of every detail of the local arrangements. Nothing seemed to have been missed that would facilitate the smooth movement of the party. Just enough was attempted and not too much, and the

visitors returned to the city in the late afternoon with interest still fresh instead of being jaded, as is often the case at the end of works circuits. There was perfect organization. The 300 guests were in the hands of 30 guides. Assignments were made to cars and the guide of a group of 10 generally kept his group together. The proper time allowance for each part of the trip had been determined in advance by traversing the selected route and going through the plants.

In "A Little Journey in the Birmingham District," a 40-page pamphlet, unusually attractive in typography and illustration, the Tennessee Company gave the visitors the main facts about the city and the remarkable developments in ore, coal and in iron and steel making in its environs. The data as to ore and coal have been published many times, but the booklet brought down to date the new construction and reconstruction programmes of the Tennessee Company. All told, the Steel Corporation since its advent in the Birmingham district seven years ago has appropriated $24,000,000 for extensions, including the $3,000,000 investment in the Fairfield plant of the American Steel & Wire Company.

ON RED MOUNTAIN

The first stop of the Friday morning excursion was made at Ishkooda, on Red Mountain. The visitors saw the hoisting of red ore from Ishkooda mine No. 13, which by air line is about five miles from the center of Birmingham. The elevation of Red Mountain at this point is 950 ft., as compared with 630 ft. at the L. & N. depot in Birmingham, and a magnificent view was had of the tall buildings of the city, while about five miles to the north could be seen the stacks at Ensley. The ore as it was hoisted from the slope in 12-ton steel skips was automatically dumped into ore buckets from which it was fed by gravity into gyratory crushers discharging direct into ore cars. Active iron mining operations on Red Mountain are carried on on a line approximately 12 miles long, through which the ore body is virtually continuous. Southeast of Red Mountain, in Shades Valley, the red ore which outcrops on the mountain has been found at depth and the Gulf States Steel Company is now sinking a 1900-ft. shaft in this valley.

Descending the mountain the train stopped next at the furnaces of the Woodward Iron Company. There are three of these with a capacity of 300 tons a day and all were in operation. The Woodward Company hauls ore and coal on its own railroad, has its own by-product coke plant, and with the furnace plant midway between ore and coal mines assembling costs are low. Ore transportation, for example, is only 4 cents a ton from the mouth of the mine to furnace bins, or about one-third the cost for Ensley furnaces. Two new Mesta blowing engines, 48 x 84 x 84 x 84 x 60, one delivered in 60 days and the other in 59 days from the placing of the order, were seen in operation at Woodward. Two others are on the ground, but have not yet been in service. A blower is also installed whose maximum capacity is 55,000 cu. ft. of air per minute.

$1,400,000 RESERVOIR AT BAYVIEW

A 45-minute run from the Woodward plant over the Birmingham Southern Railroad brought the party to Bayview, where the Tennessee Company has a slope coal mine under development. The slope is in sandstone and is inclined 26½ deg. The expected daily output is 2000 tons and the average number of men employed will be 750. At Bayview tables had been spread and a Southern barbecue was served. While the guests were at table the Tennessee Company band marched from the location to a band stand, giving a programme of ten numbers.

Bayview was of special interest in being on the somewhat sinuous and much elongated impounding reservoir of the Tennessee Company, built in 1910 and 1911. The dam is about two miles northwest of Bayview and is not far from the size of that constructed on Cross River of the Croton water supply for New York City. Its length at top between bastions is 550 ft., its width at base 81 ft., the width at top 18 ft., and the hight 91 ft. The water run-off area is nearly 75 sq. mi. The reservoir area is 325 acres, or about half a square mile, though the extreme length is about nine miles. At present the effective capacity is 2,500,000,000 gal. of water, and this can be increased to 5,000,000,000 gal. by raising the dam 15 ft. The building of this fine reservoir at a cost of about $1,400,000 solved the problem of water supply for the Tennessee Company, and made possible the important development work recently done. Water is drawn from the reservoir through an 8200-ft. tunnel of concrete 6 ft. 6 in. by 5 ft. 6 in., which has a capacity of 75,000,000 gal. a day. The tunnel leads to the central water works pumping station at Edgewater coal mine. The pumping plant consists of two high duty cross compound Allis-Chalmers pumps with a nominal capacity of 12,500,000 gal. each. The plant delivers about 270,000,000 gal. daily, under service conditions. From the pump the water flows through a 52-in. lock-bar pipe 9000 ft. long, delivering into a high level reservoir of 17,000,000 gal. capacity, from which it flows by gravity to the blast furnaces and steel works at Ensley and the wire plant at Fairfield.

At the Edgewater location, on their return from Bayview, the members of the party saw the newest and apparently most desirable mine location in the district. The commissary, in the extent of its stock and its well-kept departments, is on a par with many a city store. The character of the dwelling houses was commented on and a kindergarten building, made particularly attractive by its white latticed exterior, represented one of the more recent departures of the Tennessee Company in its welfare work. Children's playgrounds were also in evidence. The school and church at Edgewater were conspicuous buildings. In the school one-subject teaching is the method followed, each teacher giving the lesson in her specialty in the various rooms in rotation.

The Tennessee Company's by-product coke oven plant of 280 Koppers ovens, with a capacity of 100,000 tons of coke a year, was visited en route to Fairfield, where the inspection of the wire plant of the American Steel & Wire Company was the last feature of the afternoon. Due to untoward agricultural conditions the stock of sulphate of ammonia was of large proportions.

FAIRFIELD WIRE PLANT

The American Steel & Wire Company's rod mill and wire mills at Fairfield are the last important addition to the finishing capacity of the Steel Corporation, and are the last word in construction and equipment of their kind. While the lay-out is on a generous scale it is seen that all movement of stock in the procession of operations is in the shortest lines. Billets of 4 x 4 in. section are brought in cars from the Ensley works and piled in the Fairfield yard. Unloading is by electric magnet, and a magnet carried by a crane conveys the billets to

the heating furnaces. The rod mill is a combination of continuous and Belgian types. The driving of all machinery by electricity derived from the power station at Ensley is a feature of the wire mill and the carrying of so large a part of the driving mechanism under the floors. The extraordinary amount of warehouse space and the great length of the shipping platform were remarked. A comparatively new thing noted in passing was the use of shaped wire, electrically welded, for the reels of barb wire, instead of the long familiar wooden ends and spindles. Fencing is an important product of this plant and the total output of all forms of wire is 400 tons a day, when running double turn. At present the mill is operated single turn.

At Ensley Steel Works

The Saturday morning trip was to the Ensley steel works, with a stop en route at the Thomas furnaces of the Republic Iron & Steel Company. Two of the latter are in operation, producing upwards of 300 tons a day. A third furnace, practically new, the rebuilding being completed several months ago, is still idle. The Republic Company has at Thomas the largest group of beehive coke ovens in the South, comprising 910 ovens. The company obtains dolomite from a pit quarry near the furnaces.

At Ensley the six blast furnaces were visited first. They have an annual capacity of about 780,000 tons. One of them has been in blast four years on one lining and in that time has produced close to 625,000 tons. No. 1, a thin-lined furnace, is now under reconstruction. The visitors had their course marked out for them at Ensley, in going through all departments—blast furnaces, steel works, power houses, etc.—by a broad trail of lime wash. The changed conditions, at these furnaces—the cleanness of yards, the elaborate bin system, and the modern construction and equipment in every quarter—were the comment of those who had seen this group in its earlier days.

Data concerning the operation of the duplex process were put in the hands of visitors. One of the mixers is of 250 tons capacity and the other of 600 tons. The mixer metal runs 3.8 per cent. carbon, 0.91 per cent. silicon, 0.041 per cent. sulphur, 0.81 phosphorus and 0.40 manganese. In duplexing the metal is blown in 20-ton converters to eliminate partly or completely, silicon, manganese and carbon. The blown metal has the following composition:

	Si	C	Mn
First ladle	0.01	0.07	0.01
Second ladle	0.02	0.06	0.02
Third ladle	0.02	0.06	0.02
Fourth ladle	0.03	2.76	0.05
Fifth ladle	0.03	3.10	0.05

The eight open-hearth furnaces have a capacity of 750,000 tons a year. In making rail steel, three soft converter heats are followed by two high-blown heats, the latter containing 3 per cent. carbon. The addition of the first high-carbon heat gives a violent reaction; with the addition of the second the reaction is milder. When the bath becomes normal, if phosphorus and carbon tests are satisfactory the full heat is quickly poured.

SOUTHERN-MADE INGOT MOLDS

In view of the high freight cost of ingot molds brought from the North, the Tennessee Company at one time experimented in the manufacture of steel molds and these were in use over a considerable period. They were given up, however, owing to the persistent tendency to warp. The possibility of producing cast-iron ingot molds in the South had not been thought of in the assumed absence of low-phosphorus material. However, the Tennessee Company went into the problem and apparently has solved it satisfactorily. For a time the mixture made included the low-phosphorus Cranberry pig iron. But the expense was a drawback. Thereupon it was suggested that the company had in its rail mill scrap a very low phosphorus material, and that if special pains were taken to lower the phosphorus, in pig iron made for the purpose, an ingot mold mixture could be had at home. This was worked out and for some time the company has made its own ingot molds besides furnishing such molds to other Southern steel works. The pig iron is produced from specially selected brown ores, and is made in runs of 3000 to 4000 tons. Another interesting point in the practice at Ensley is that since ferromanganese has been produced there the company has utilized all its slag produced in the operation, charging it into the Ensley blast furnaces. Its 10 to 12 per cent. of manganese brings up the manganese content of the basic iron to a point which obviates skulling in the Bessemer converter in duplexing.

AT THE RAIL MILL

The Ensley inspection also included the blooming and rail mills and finishing departments and the loading of rails into cars by the use of lifting magnets. The 44-in. blooming mill is driven by a 55-in. x 66-in. direct-connected Mesta reversing engine. The 24 x 24-in. ingot weighs 9500 lb. and there are 13 passes in the reduction of the ingot to an 8 x 8-in. bloom, for rail or billet mill. There are four roughing passes in the rail mill and five finishing passes. As high as 62,000 tons has been produced in a month by the blooming mill and the month's record on rails is 46,000 tons. The management states that steam requirements have been so largely reduced as a result of installing mixed pressure turbo blowers at the blast furnaces and turbo generators at the rolling mills that normally the surplus steam generated at the blast furnaces is sufficient to operate the mills. This steam was carried in a 16-in. line 3200 ft. long, and a 14-in. line has since been added. The great central electric station at the Ensley steel plant was a subject of comment for architectural and other features which bordered on the artistic. Interior appointments also went quite beyond the bounds of severe utility. The white suits of the engineers were in keeping.

At intervals in the yards at the Ensley plant were shrubbery and grass plots, and efforts in these lines seem to have increased in recent years so that the contrast between Northern and Southern works, once very unfavorable to the latter, is now in many cases in their favor. Southern managers give positive testimony as to the returns that have come in more and better work and the reduction of accidents.

As a final souvenir of the two days' travel each of the visitors was presented with a boll of cotton as the train returned at 1 o'clock Saturday afternoon to Birmingham. On arrival at the L. & N. depot, J. G. Butler, Jr., mounted a truck to lead the party in expressing their high appreciation of the attentions of their hosts. Mr. Butler proposed a vote of thanks to the Tennessee Coal, Iron & Railroad Company, to President Crawford and to the ladies and representative men of Birmingham who had so overflowed with hospitality to their visitors. Three cheers were given for Mr. Crawford as he was called out to respond. It was a fine finishing touch to a three-days' round of sight-seeing and so-

cial pleasures that may well stand as a record for such meetings.

Echoes of a Great Meeting

Members of the Institute have an increasing esteem for the button which Secretary McCleary has made the identification badge for all meetings. It bears in enamel and gold the emblem of the Institute, which was designed by Theodore W. Robinson, first vice-president of the Illinois Steel Company, and first brought out at the Chicago dinner given the European guests of the Institute on the tour of October, 1910.

The social attentions shown the visiting members and their ladies by the residents of Birmingham were well nigh continuous. There were afternoon receptions and various automobile trips for the ladies. The chief social event was the reception given to all the visitors at the Birmingham Country Club Friday evening. It is to be doubted if any better appointed country club exists or one making so varied an appeal to its guests in its construction, in beauty of interior and surroundings, or in the many-sided view it commands. It is to be gathered from many signs that Birmingham's fame is due not less to the spell of its social life than to the material things that are commonly counted as its chief asset.

A dinner was given in Judge Gary's honor at the Birmingham Newspaper Club Friday night. A number of well-known men and women of Birmingham were present besides representatives of the Iron and Steel Institute.

The general committee on arrangements for the Birmingham meeting consisted of James A. Farrell, chairman, E. A. S. Clarke, John C. Maben, Charles M. Schwab, John A. Topping and Frank S. Witherbee.

Of the 21 directors of the Institute the following were in attendance: James A. Campbell, John C. Maben, William A. Rogers, Joseph G. Butler, Jr., Edmund A. S. Clarke, Willis L. King, William H. Donner, Leopold E. Block, James A. Farrell, Edgar C. Felton and Elbert H. Gary. Ten directors were absent.

A Canadian Visitor

One of the guests at the meeting was G. C. Mackenzie of the Mines branch, Department of Mines, Ottawa, Canada, who is a member of a commission recently appointed by the Canadian Government to make an inquiry into the condition of the iron mining industry of Canada. Other members of the commission are O. E. Leroy, E. Lindeman and J. M. McLeish, secretary. The commission is to report on the following points: Occurrences of iron ore; size of ore bodies with tonnages or some such estimate as will furnish information as to the order of magnitude; composition of the ore; equipment of mines; cost of mining and of preparation of the product for the smelter; transportation costs; prices at furnace points and competition at furnace points with foreign ores; methods of mining, beneficiation and metallurgical treatment, both local and foreign, that might be applicable to Canadian ores; also local industries that might be created or stimulated by the development of the iron resources.

A Chattanooga Visit

Chattanooga showed admirable persistence in urging a stop-over of the returning travelers from the North. When the train carrying the Eastern delegation stopped at Chattanooga Wednesday evening, P. J. Kreusi, president of the Chattanooga Chamber of Commerce, and others boarded it to extend personally an invitation to Judge Gary and through him to the members of the Institute to be their guests for a tour of the city on their return trip. This invitation was renewed in a telegram which was read at the banquet Thursday evening. On Saturday a number of members spent several hours in Chattanooga, going to Lookout Mountain, Missionary Ridge and Chickamauga Park, and seeing something of the marked industrial development of the past few years.

Steps in Birmingham's Iron Industry

Historical data of iron and steel development in the Birmingham district are thus summarized:

1818. First blast furnace in Alabama (Russellville).
1827. First coal mined in Warrior coal field.
1854. First coke made from Alabama coal (foundry use).
1858. First rolling mill built (Shelby).
1863. Oxmoor furnace built (Birmingham district).
1864. Red Hematite from Red Mountain first used.
1871. Birmingham founded.
1878. First coke pig iron made in Alabama (Oxmoor).
1879. First rolling mill built in Birmingham.
1888. First steel made in Alabama was poured March 8 at the plant of the Henderson Steel Mfg. Company, North Birmingham.
1895. Basic iron first made at Alice furnace, July 12.
1899. The first steel made by the Tennessee Coal, Iron & Railroad Company was poured Thanksgiving Day, November 30. This plant consisted of ten 50-ton tilting furnaces of the Wellman type. These furnaces were abandoned in 1908 and replaced by the present 100-ton furnaces.

Members Attending

A revised list of members in attendance at the meeting follows:

T. H. Aldrich, Anson W. Allen, J. I. Andrews, M. C. Armour, C. G. Atwater.

F. Baackes, F. E. Bachman, R. W. Bailey, George Baker, W. H. Baldridge, H. G. Baldwin, Edwin Ball, A. F. Banks, Edward M. Barnes, C. J. Barr, Henry A. Barren, H. B. Barren, D. M. Barringer, Gordon Battelle, Charles L. Bauer, L. T. Beecher, S. B. Belden, E. H. Bell, T. H. Benners, C. W. Bennett, John J. Bever, Herbert F. Black, C. M. Blanchard, L. E. Block, H. L. Bodwell, R. W. Boland, Ernst Boley, J. W. Bonney, James Bowron, D. S. Boynton, H. S. Braman, H. A. Brassert, T. J. Bray, J. J. Brooks, Jr., Fayette Brown, Jr., C. E. Buek, E. J. Buffington, W. P. Burdick, Frank A. Burr, M. W. Bush, Joseph G. Butler, Jr.

J. A. Campbell, L. J. Campbell, Augustus W. Carey, A. H. Carpenter, H. S. Chamberlain, G. H. Charls, E. A. S. Clarke, J. A. Coakley, H. W. Coffin, William Edward Collier, J. Z. Collier, George W. Connors, Edward B. Cook, H. H. Cook, Henry R. Cornelius, William A. Cornelius, Harry Coulby, E. R. Crawford, George G. Crawford, W. D. Crawford, Frank H. Crockard, H. W. Croft, Frank G. Cutler.

H. G. Dalton, Henry J. Davis, S. A. Davis, Lorenzo C. Dilks, A. H. Dillon, A. C. Dinkey, A. W. Dodd, W. H. Donner, David Dows, Daniel J. Driscoll.

J. J. Eagan, Richard H. Edmonds, V. E. Edwards, C. H. Elliott, J. S. Elverson, F. L. Estep, H. Cole Estep, David Evans, D. L. Eynon.

C. T. Fairbairn, Jacob M. Faris, James A. Farrell, E. C. Felton, A. I. Findley, J. F. Fletcher, E. C. Foust, Thomas B. Foust, Willard Fuller.

William Gardner, Elbert H. Gary, H. M. Gassman, F. C. Gedge, Jerome R. George, William P. Gleason, Thomas K. Glenn, P. J. Gordon, H. C. Greer, E. S. Griffiths, James H. Grose.

W. E. Hadley, Edward M. Hagar, Horace Hammond, James H. Hammond, H. T. Harrison, Joshua A. Hatfield, M. P. Gentry Hillman, Alexander L. Hoerr, Henry R. De Hoff, Clarence H. Howard, W. S. Horner, Elton Hoyt, 2d, F. B. Hufnagel, John Hughes, William H. Hughes, John Hulst, J. W. Hubbard, O. N. Hutchison.

Laurence Iverson.

Ward W. Jacobs, Alex. Jarecki, Henry L. James, R. H. Jeffrey, Thomas M. Jewell, G. W. Jewett, William Larimer Jones.

John W. Kagarise, C. F. Kaufholz, J. S. Keefe, T. W. Kennedy, J. F. Kent, G. C. Kimball, Willis L. King, Morris Knowles.

K. Landgrebe, W. E. Leake, Leif Lee, Richard H. Lee, John W. Lees, George K. Leet, John F. Lewis, Eugene Guy Lilly, Silas J. Llewellyn, R. R. Luckie, Charles W. Lutz.

J. C. Maben, J. C. Maben, Jr., A. F. Mack, George C. Mackenzie, C. E. Maeder, Charles Major, C. S. Marshall, Orville A. Marsteller, S. Livingston Mather, David S. Mathias, T. H. Mathias, William G. Mathias, Howard W. McAteer, J. T. McCleary, C. H. McCullough, Jr., Thomas McDonald, C. L. McGowan, E. M. McIlvain, Arthur G. McKee, James W. Mc-

Queen, J. H. McWane, D. B. Meacham, Augustus F. Meehan, W. M. Mehlhorn, C. J. Mesta, George Mesta, C. L. Miller, C. A. Moffett, E. C. Morgan, Paul B. Morgan, Frank G. Morris, Wallace C. Moulton, E. W. Mudge.

Robert W. Ney, Karl Nibecker, John A. Nichols, Lloyd Noland, Frank H. Nullmeyer.

William P. Palmer, E. W. Pargny, A. C. Parsons, Will J. Penhallegon, John A. Penton, H. F. Perkins, W. B. Perley, Charles R. Phipps, W. S. Piling, James W. Porch, W. C. Prendergast, Veryl Preston.

B. D. Quarrie.

Walter Rachals, Robert Radford, R. L. Rathbone, Erskine Ramsay, Samuel J. Reeves, W. C. Reilly, G. A. Reinhardt, C. R. Robinson, C. S. Robinson, T. W. Robinson, William A. Rogers, George E. Rose, Lewis P. Ross, E. J. L. Rust, H. B. Rust, H. C. Ryding.

Dez C. Schonthal, W. T. Shannon, J. H. Sheadle, W. W. Shilling, George S. Shimer, J. W. Shook, Paschal Shook, G. W. Short, W. P. Siebert, James W. Smith, Harrison Souder, F. N. Speller, James I. Stephenson, H. Stewart, Charles A. Stillman, J. S. Stillman, E. E. Stone, Allan Strale, Theodore Swann.

Arthur W. Taylor, Wade A. Taylor, Charles S. Thomas, E. P. Thomas, H. Spence Thomas, W. A. Thomas, David P. Thompson, George G. Thorp, Fred Tod, P. Toulmin, H. Tutwiler.

J. S. Unger.

Charles A. Vogt, George W. Vreeland.

J. D. Waddell, William R. Walker, B. A. Wallingford, Jr., G. B. Waterhouse, E. T. Weir, S. T. Wellman, Harry D. Westfall, J. W. Whatley, Seymour Wheeler, C. E. Willard, F. H. Winslow, Willard Wilson, F. W. Wood, L. A. Woodard, Leonard G. Woods, A. H. Woodward, H. Wright.

Andrew G. Young.

C. H. Zehnder.

OBITUARY

D. J. NICHOLAS, general manager of the Allegheny Foundry & Machine Company, Oliver Building, Pittsburgh, whose plant is located at Glassmere, Pa., was killed October 27, an an automobile accident. Two years ago he, with others, organized the company. He leaves his widow and seven children.

PERSONAL

Henry M. Atwood, chairman of the board of directors of the Pittsburgh Valve, Foundry & Construction Company, Pittsburgh, since its organization, has resigned that position, but continues with the company as a member of the executive committee and also a director. Mr. Atwood was formerly of the firm of Atwood & McCaffrey, having a large foundry on Third avenue, Pittsburgh, which was taken over by the Pittsburgh Valve, Foundry & Construction Company when it was organized in 1900. His action in resigning the office named was entirely voluntary and arose from a desire to be relieved from details as much as possible.

O. R. Jones, formerly chief electrician of the Youngstown Sheet & Tube Company, has resigned to accept a similar position with the Youngstown Iron & Steel Company, Youngstown, Ohio. He was presented by the employees of the electrical department with a gold watch and chain and Masonic charm.

J. L. Replogle, vice-president and general manager of sales, Cambria Steel Company, whose removal to Philadelphia from Johnstown has been announced, took possession this week of the office which had been prepared for him on the seventeenth floor of the Morris building.

R. W. Wheeler, formerly assistant sales manager in the tire and accessories department of the B. F. Goodrich Company, Akron, Ohio, has become connected with the Osborn Mfg. Company, Cleveland, Ohio, as assistant central division sales manager, with headquarters in Cleveland. T. H. Callahan has been appointed resident manager of the company's plant at New Durham, N. H., succeeding L. M. Gamwell, who is now connected with the sales department, and also succeeding R. C. Jenkins, the assistant resident manager, who has resigned. M. W. Seaman, formerly with the mechanical engineering department, has become sales engineer in the molding machine department for Ohio and Kentucky territory.

Joseph Kramer has resigned as vice-president of the Kramer Brothers Foundry Company, Dayton, Ohio.

F. F. Woods, for some years in the selling department of the Epping-Carpenter Company, Pittsburgh, has been made sales manager, a new office just created.

Ben C. Holt, of the Holt Mfg. Company, who has been in charge of the plant at Stockton, Cal., has become general manager of the Spokane, Wash., branch of the Northwestern Harvester Company, which is preparing to expand its operations.

James A. Nickell, secretary of the Smith-Booth-Usher Company, Los Angeles, Cal., visited a number of machine-tool plants in Cincinnati last week.

A. L. Andrews, president Andrews Steel Company and Newport Rolling Mill Company, Newport, Ky., departed last week for his winter home at Sewalls Point, Fla.

C. E. Carpenter, sales manager of the Allied Machinery Company of America, Paris, France, inspected a number of machine-tool plants in Cincinnati last week. He will return to Europe some time this month.

George W. Lyndon, who has been secretary and treasurer of the Association of Chilled Car Wheel Manufacturers since its organization, was elected president at the New York meeting of the association held October 27.

H. V. Jamison, director of exhibits of the United States Steel Corporation and identified interests at the coming Panama-Pacific International Exposition, has gone to San Francisco to superintend the arranging of the exhibit. He will be in San Francisco for the next six months or more. Mr. Jamison is advertising manager of the American Sheet & Tin Plate Company at Pittsburgh.

F. S. Woods will succeed R. Bowen as manager of sales of the Epping-Carpenter Company, pump manufacturers, Pittsburgh. A. A. Fraunheim will be general manager. Mr. Bowen has been elected president of the Canton-Hughes Pump Company, Wooster, Ohio.

Pittsburgh Foundrymen's Association

The regular monthly meeting of the Pittsburgh Foundrymen's Association was held in the Fort Pitt Hotel on the evening of November 2, preceded by a dinner. In the afternoon a large number of the members made a visit to the Pittsburgh testing station of the United States Bureau of Standards. Among special exhibits arranged for the visitors were a modulus of elastic test of steel, gray iron and malleable iron on the bureau testing machine, a pulling test on steel wire, tests of firebrick under load at high temperatures, experimental work in a small electric furnace, different varieties of pyrometers and longitudinal sections of a standard steel ingot from a Pittsburgh mill and of an ingot made under the Hadfield compression process. Sample castings were shown for the Hell Gate bridge at New York City, which are awaiting compression tests up to 6,000,000 lb. In the evening P. H. Bates, in charge of the Pittsburgh station of the Bureau of Standards, gave an address, explaining in some detail the work of the bureau, stating that the station will be ready at all times to aid foundrymen in the Pittsburgh district in any way it can. A. V. Belleininger, a chemist in the employ of the bureau, told what is being done in making tests of clays, with the object of producing porcelain equal to that made from European clays.

The thirteenth annual reunion and banquet of the Veteran Employees' Association of the Westinghouse Air Brake Company was held last week at Wilmerding, Pa. The members are those who have served 21 years in continuous employment. A feature of the occasion was the presence of 11 of the first employees who are still with the company. Many of the officers were present, including H. Herman Westinghouse, the new president. Christopher Horrocks, the first man employed by George Westinghouse in his original shop, delivered an address on "George Westinghouse, the Man."

The Machinery Markets

The pressure on manufacturers for lathes and a few other types of machine tools wanted for export to the belligerent countries is easier, although it is still an important factor. The general domestic demand continues dull, for the most part, although the making of shrapnel for foreign governments is opening a channel for the sale of tools. In New England the export demand is still the large feature. New York is giving a great deal of attention to the shrapnel question and the demand it has created. Detroit is dull, with single machines in moderate demand, but a good sign is seen in improved activity on the part of the foundries. In Cleveland there have been inquiries for second-hand machines for export and new tools are expected to move also, but the domestic business continues dull. In Cincinnati it is found that the existing export business is the best of this year. Milwaukee reports that October was a better month than September. General conditions are unchanged in Chicago, which has had but a limited amount of the export business. Machinery is moving slowly in the Central South, although a slight improvement is felt. The better cotton situation has made the outlook brighter in Birmingham and the machinery trade has felt the influence. A better feeling, due to general causes, exists in St. Louis. The Texas market has changed but little, although there are indications of a revival in business. On the Pacific coast there is a growing feeling of confidence in industrial circles, the export trade is more active, and a good winter business in tools and equipment is looked for.

New York

NEW YORK, November 4, 1914.

The flurry of demand for machine tools for export appears to have subsided so far as this city is concerned, but the trade sees a brighter outlook. Local salesmen are concentrating their attention on the possibilities of selling machines to those who have taken contracts from foreign governments to make shrapnel, which are variously made out of solid bar stock or forged blanks. The E. W. Bliss Company, Brooklyn, which has taken a shrapnel contract, has been in the market for engine lathes and grinding machines, and also has purchased 8 Cleveland automatics, the latter being used for making the fuse and timing mechanism. In some cases the interior of the blanks are machined to their extreme depth, and in all cases, sufficiently to insure the balance of the shell. Where bar stock is used, the shell, of course, is bored to size and full depth. The end of the shell has a taper, which is turned or swaged. A tight fit in the bore of the gun is insured by copper or bronze bands around the largest diameter of the shell. The loading of the shrapnel is left to experts in that line.

The Frankford Arsenal, Philadelphia, is in the market for three Lodge & Shipley engine lathes, specially tooled for making shrapnel. It is understood that the arsenal has been authorized by the government to make or have made one million small-size shrapnel, and the special tools required for the three lathes are designed to form the taper on the shells. The need of the United States probably will give business to those companies which make a specialty of projectile work and that have not taken orders from abroad. In Canada all kinds of machine shops are turning their attention to shrapnel-making for the British government, a fact which is disclosed by the inquiries which makers of turret lathes have been receiving.

In connection with the recent buying for export it is interesting to note that in some cases orders were received direct by cable, as a result of cable inquiries, and that payment was made through two of the largest banking institutions in this country. A company in the Middle West which shipped 45 machines to New York for export had both the machines and the money to pay for them in its possession at one time.

The Bosch Magneto Company, which recently bought out the Rushmore Dynamo Works, Plainfield, N. J., is preparing a small list of engine lathes and drill presses. It probably will be out this week.

The Standard Oil Company has purchased for export to Peru, S. A., 2 combination punches and shears, capable of punching a 2½-in. hole through ⅝-in. material, and a set of bending rolls, also for Peru.

The Le Fevre Arms Company, Maltbie street, Syracuse, N. Y., is receiving bids for construction of a machine shop, 38 x 70 ft.

The Sedgwick Machine Company, Poughkeepsie, N. Y., is having plans prepared for a woodworking shop, etc.

The Bauer Chemical Company, 30 Irving place, New York, has let contracts for factory at Oneonta, N. Y., for two two-story buildings, 42 x 82 ft. and 45 x 62 ft., respectively, and a power house, 44 x 45 ft., to cost $50,000.

The Universal Tractor Company, 445 Hawthorne street, Brooklyn, N. Y., has purchased a plant formerly operated at Newcastle, Ind., and will manufacture a gasoline cultivator. F. O'Sullivan is in charge.

The Universal Film Company, 1600 Broadway, New York, has begun the erection of a factory 66 x 145 ft., one story and basement. E. B. Kinsella, 228 West Forty-second street, New York, is the contractor.

The Dalton Machine Company, 108 East 129th street, New York, manufacturer of bench lathes, has installed an assembling plant at 79 West 130th street, giving it over 4000 ft. of additional floor space.

The Standard Fireproof Sash & Door Company, 182 Diamond street, Brooklyn, N. Y., has awarded the contract for alterations to its factory, etc., to cost about $5000.

The City Commission, Hackensack, N. J., will receive bids until December 7 for a sewer system, pumping station, etc.

The National Porcelain Company, Trenton, N. J., has had plans drawn for a factory, 40 x 100 ft., two stories, and 30 x 100 ft., one story, to cost about $20,000.

The Crescent Brass Works, Reading, Pa., will erect a one-story aluminum foundry, 24 x 30 ft.

The Caloris Company, Millville, N. J., has had plans drawn for a one-story brick factory, 70 x 160 ft.

The Milton Brick Company, Milton, Pa., will build an addition to its plant to cost $35,000. Thomas Wilson should be addressed.

The Atlas Production Company, Buffalo, has been incorporated with a capital stock of $50,000 to manufacture a special process steel, engines, boilers, tools and automobile parts and accessories. George L. Schupp, 442 Sherman street, is president, and William A. Hyle is general manager.

A boiler house 40 x 42 ft., one story, of hollow tile and stucco, is to be built at Oneonta, N. Y., by the Sheffield Farms, Slawson-Decker Company, 524 West Fifty-seventh street, New York, N. Y. W. H. Sheffield, Hobart, N. Y., is president.

The Jewell Steel & Malleable Company, Hertel avenue and the New York Central Railroad, Buffalo, is having plans prepared for a core room, 60 x 140 ft., of brick and concrete.

The Standard Rolled Products Company, Buffalo, has increased its capital stock from $50,000 to $75,000.

The Buffalo Meter Company, 290 The Terrace, Buffalo, of which George K. Bassett is president, has started its new factory building, 80 x 200 ft., four stories and basement, at North Main street and the Erie Railroad.

The plant of the Harrison Mfg. Company, manufacturer of radiators, Elm street, Lockport, N. Y., is to be enlarged, as increased capacity is required to care for large orders received from England since the war began.

The Fibre Conduit Company, Orangeburg, N. Y., has let the contract for the construction of a power house, 44 x 46 ft., one story, of brick and steel. S. R. Bradley is president.

The plant of the Adamite Abrasive Company, Schenck and Duckwitz streets, North Tonawanda, N. Y., was totally destroyed by fire October 29. It was on leased property, but arrangements for rebuilding are under way.

W. E. Sexton, engineer, Mineola, N. Y., has prepared plans for a water system, including filtration plant, to be installed at Lindenhurst, N. Y., at an estimated cost of $70,000.

New England

BOSTON, MASS., November 2, 1914.

The week has seen some interesting and important developments in the machine-tool industry. Germany is buying engine lathes, to be shipped via Sweden. These are of the quick change gear type, as contrasted with the plain lathes which made up the bulk of the big orders recently received from Russia. Greece is buying geared head lathes and heavy drilling machines for use in artillery repair shops, it is stated. Russia is still placing orders; probably between 300 and 400 lathes have been sold in the week. It is understood that Russia will place other large orders as soon as arrangements have been made for establishing credits in the United States. France, according to the published reports, will use the $10,000,000 loan, placed with American banking interests, in creating a checking account, to provide for payment for war materials purchased in this country. England has already arranged to take care of her very large buying, and other countries engaged in war will pay cash for everything purchased in the United States.

The milling machine business, as a whole, has been given a great impetus. Some large orders have been booked, and others will be placed, it is understood, as soon as proper credits are provided for.

The biggest event of the week in the machine-tool trade, is the order for machines placed with the Becker Milling Machine Company, Hyde Park, Mass., for shipment to England and France, to be used in arsenals. It comprises 40 machines of the vertical type and of the largest sizes built by the company. They are divided between the No. 6 vertical and the Model C high power miller. Some idea of the magnitude of the order may be obtained from the fact that the No. 6 machine weighs 4½ tons and the model C 4 tons. In addition the company has inquiries for 15 machines of a smaller class, the No. 3. The company is now operating on a 50 per cent. basis; but plans to be running full within 30 days.

Some of the lathe manufacturers are operating with greater capacity, but are following the conservative policy as stated last week.

As far as actual munitions of war are concerned—the actual fighting weapons and their cartridges—the United States is swept bare of supplies. Of the gauges of cartridges for the English army rifle and field gun, contracts are in hand to keep all the American manufacturers rushing at full capacity for 2½ years. The Mexican government and the opposing factions cannot get Mauser cartridges, though they are making every effort to do so. They are out of the market. Even the relatively small order of 50,000 has been refused. No manufacturer will even consider it, though the terms offered are cash in New York. Cable orders for ammunition are received almost daily, and so are orders for weapons. The manufacturers of machine guns, field guns and cannon of larger caliber have contracts that put them out of the market for a long time to come. These activities extend through other industries. For example, European practice calls for steel covered shrapnel shell. The pressed steel people are receiving important orders for the projectile covering and for the brass cases for various sizes of fixed ammunition. Most significant are inquiries from Europe not yet ready to announce, which should mean large increases in capacity in the works of American manufacturers of these various classes of product. Authentic figures named privately are of prodigious size.

Word comes that inquiries for 25,000 picks, for use in digging trenches, have been received. Great quantities of shovels, or rather small spades, have already been shipped to Europe, for war purposes.

In the manufacture of all of these products much machinery is used. The demand has already exceeded the supply, as is instanced by the cartridge industry, which must have a great number of presses for drawing brass, and some for drawing steel. The firearms people have already added very largely to their equipment, and if present inquiries develop into orders, their requirements will be even larger. The same promise extends all along the line in various branches of production.

The Remington Arms-Union Metallic Cartridge Company, Bridgeport, Conn., has prepared plans for an addition to its Bridgeport works, which confines its activities to the manufacture of cartridges. The building will be five stories high, 48 x 240 ft., with an ell 48 ft. square. It is stated that $50,000 worth of structural steel will be required. The contract has been placed with the Berlin Construction Company, Berlin, Conn. The structure is in addition to the one-story building now in process of erection, and will be used, according to the general understanding, for the drawing of cartridge shells, or cases.

The Waltham Foundry Company, Waltham, Mass., has been incorporated by Anthony A. Curtin and Thomas I. Curtin, with a capital stock of $40,000.

The F. W. Lombard Chair Company, Fitchburg, Mass., will rebuild its factory recently destroyed by fire.

The Skinner Chuck Company, New Britain, Conn., is proceeding rapidly with the erection of the addition to its plant.

Broadbent & Co., Unionville, Conn., have begun the erection of a three-story factory, 50 x 100 ft., of mill construction.

Chicago

CHICAGO, ILL., November 2, 1914.

In the past few weeks Western manufacturers of machine tools have participated to a limited extent in the export business which was most largely placed in the East. An order for turret lathes was divided between two Western manufacturers, and at Rockford three manufacturers of milling machines disposed of all the machines in stock, one of them receiving an additional order, the filling of which is now almost entirely responsible for operation of the factory. A further order for milling machines is under negotiation. A few drilling machines have also been purchased for service in the field repair shops of the allied armies.

While this export business has been very desirable from the standpoint of cleaning up stocks and of price, it does not represent any substantial change in the operating situation for the majority of tool builders, unless further orders are to follow. A number of manufacturers still have outstanding propositions made some time ago upon railroad inquiries, a prominent case in point being the machines for the new shops of the Chicago & Western Indiana. Shipping instructions for these tools are still withheld. No acceptances have been made as yet in connection with the quotations taken by the Pennsylvania Railroad some time ago for its repair shops at Whiting. It is thought that new quotations will be invited.

The municipality of Chicago is taking bids this week for the equipment for its new foundry, described some time ago in *The Iron Age*. It will melt both gray iron and brass. The city is also buying for pumping stations two single-stage centrifugal type bilge pumps, two centrifugal boiler feed pumps and two 2,000,000-gal. motor-driven centrifugal pumps.

The American Building Foundry Company, 2300 South Springfield avenue, Chicago, has moved into its new plant and is now operating.

The Chicago Sheet Metal Company is now located at 824 West Thirty-sixth street, Chicago, where it has available considerably increased capacity for the manufacture of metal specialties as well as equipment for tin-plating.

The Van Dorn Mfg. Company, Chicago, has opened general offices and salesrooms at 227 West Erie street.

The Peerless Machine Company, Freeport, Ill., recently incorporated, advises that the products it manufactures include steel barrel fittings, consisting of faucets, bungs, plugs, gaskets, etc., as well as other screw machine products.

The National Cigar Vending Machine Company, Canton, Ill., has been incorporated with a capital stock of $5000 by J. A. Ray and C. L. Hughes, to manufacture and deal in vending machines.

It is announced that the Northwestern Barb Wire Company, Sterling, Ill., will remodel its entire plant within the next 18 months, and make it among the largest independent wire mills in the United States.

The plant of the American Clay Products Company, Roanoke, Ill., was destroyed by fire with a $25,000 loss.

The K. Z. Mfg. Company, Casey, Ill., has been incorporated with a capital stock of $100,000 to make gasoline dispensers. W. B. Linn, J. E. Bennett and J. H. Parker are the incorporators.

Hinsdale, Ill., will receive bids until 7.30 p.m. November 16 for a water-softening plant, together with storage tank, chemical storage building, pumps, meters and pipe connections necessary. A certified check for $1000 is required.

The Dietrich Mfg. Company, South Bend, Ind., recently incorporated, will not build a factory for the present.

The Des Moines City Railway Company and the Inter-Urban Railway Company, Des Moines, Iowa, plan the construction of a car barn and shop next summer. Emil G. Schmidt is president of both companies.

The Dayton Cycle Car Company, Joliet, Ill., has increased its capital stock from $50,000 to $100,000, changed its name to the Crusader Motor Car Company, and will increase its mechanical equipment.

Detroit

DETROIT, MICH., November 2, 1914.

The local machine-tool market continues dull. A moderate demand for single tools, both new and second-hand, is reported; but that is about all. Manufacturers of machinery say domestic business is fair, and in some lines good-sized orders are coming for export. The number of inquiries from Europe is stated to be considerable. A fair demand is found for most kinds of electrical equipment in the smaller units. Jobbing foundries, both gray iron and steel castings plants, are somewhat better engaged. Construction work has again decreased and practically nothing is in sight locally that is of interest to the trade.

The Studebaker Corporation, Detroit, automobile manufacturer, has awarded the contract for the erection of coal-handling apparatus at its No. 3 plant.

The Rob-Roy Mfg. Company, Detroit, has been incorporated with a capital stock of $20,000 and will engage in the manufacture and sale of automobile parts. The incorporators are Robert Wachman, Leroy May and William E. Burns.

The Kay Salt Company, Detroit, has acquired the plant of the Peninsular Salt Company and is enlarging it and installing additional equipment.

The J. E. Bolles Iron & Wire Works, Fourth and Porter streets, Detroit, manufacturer of ornamental iron work, is enlarging its factory by the erection of an additional story. The company reports a good volume of new business.

The Electric Welding Company, Detroit, has been incorporated with $50,000 capital stock. The incorporators are A. W. Maire, A. F. Sellers and E. A. Buchman.

The United States Novelty Mfg. Company, Detroit, has been incorporated with $10,000 capital stock. William Kadow and Emil Cartier are the principal stockholders.

The Van Blerck Motor Company, Monroe, Mich., manufacturer of marine and stationary engines, has increased its capital stock from $100,000 to $135,000 and contemplates additions to its plant

The Kirsh Mfg. Company, Sturgis, Mich., has increased its capital stock from $150,000 to $250,000 to provide for increasing business.

The Fulton Mfg. Company, Chicago, which is to remove its business to Bay City, Mich., has formally incorporated under Michigan laws, with a capital stock of $150,000. Work on the new plant of the company, of two connecting buildings 100 x 140 ft. and 70 x 260 ft. respectively, is being rushed.

The Alma Standard Foundry & Mfg. Company, Alma, Mich., will add the manufacture of furnaces to its line. An addition to the plant will be erected and some equipment installed.

The John M. Fay Foundry Company, St. Joseph, Mich., has awarded contracts for the erection of a foundry. It is now occupying temporary quarters.

An item in *The Iron Age* of October 29 to the effect that the Universal Products Company, 518 Woodbridge street, east, Detroit, Mich., is to occupy a part of the former plant of the Brady-Nagel Mfg. Company, is in error. The latter company has not given up any part of its plant; but has arranged to make the product of the former company.

Cleveland

CLEVELAND, OHIO, November 2, 1914.

An English machine-tool dealer has visited several cities the past week, looking for second-hand American tools. He has purchased a number from a Cleveland dealer and is negotiating for others. He is also planning on the purchase of some of the stock of new lathes on dealers' floors. Some fairly good additional orders for turret lathes have come from Europe, and a Cleveland builder has just shipped 24 lathes to Russia. Foreign inquiries are plentiful; but quite a few of these are not regarded as bona fide inquiries, apparently coming from speculators or others who hope to take advantage of the possible shortage and have in their control machines that they can dispose of to the several governments or other users. The domestic demand for machinery is dull, but an improved activity in second-hand machinery is noted. Quite a few orders were booked for second-hand tools last week and a number of inquiries are pending from scattering sources.

The W. S. Tyler Company, Cleveland, will erect a small four-story addition to its plant to cost about $11,000. No new machinery will be required.

The Standard Galvanizing & Mfg. Company, 726 Canal road, Cleveland, plans to place on the market a line of galvanized nails and tacks and expects to be in the market shortly for nail-making and tack-making machinery.

The Wallis Tractor Company, Cleveland, which has been equipping a plant on East Seventy-second street for the manufacture of farm tractors, has placed it in operation.

The Cleveland Worsted Mills Company is preparing plans for a dye-house to be erected in connection with its Ravenna, Ohio, plant. It is not expected that work will be started before spring.

The American Tar Products Company, Chicago, Ill., has commenced the construction of a plant in Youngstown, Ohio, for the manufacture of pitch and oils. Five buildings will be erected, including a still and boiler house, a condenser house, a saturation building and warehouse, and a pulverizing building. The products will include creosote oil for timber preservation, pitch and tar filling.

The Akron Selle Company, Akron, Ohio, maker of automobile vehicle and truck specialties, is in the market for an up-to-date plating plant. A second-hand plant is preferred.

Milwaukee

MILWAUKEE, WIS., November 2, 1914.

The machine-tool trade shows a further slight improvement, due to export inquiry and some actual sales. October business was a bit better than the September trade. Domestic inquiry continues to be rather disappointing, and the few sales that are being made are featureless and give little hope for increased purchasing in the immediate future. In general the machinery business is just appreciably better. Nearly all interests have resigned themselves to the belief that little is to be expected before January 1. Factory pay-rolls are stationary. As a rule the demands on shops occasioned by new business result in the extension of curtailed working hours rather than additions of workmen.

The new brake shoe foundry of the Railway Materials Company, Chicago, Stevens Point, Wis., will start operations at the close of this week. Work on remodeling and re-equipping the former main building of the Wisconsin Central shops is practically completed. While the working capacity of the new foundry is 200 operatives, only 60 to 75 men will be employed at the start, pending improvement in railroad purchasing. For the present the Stevens Point foundry will take care only of the overflow business of the company's other two foundries, one at Toledo, Ohio, and the other at Phoenixville, Pa. F. S. Hebden is in charge of operations at Stevens Point.

The General Machinery Company, Menominee, Mich., organized recently by R. H. Smead and William Somerville, has started operations in the former Northwestern House, which has been equipped for the production of sawmill, mining and pumping machinery and equipment. The initial force consists of 10 men.

The National Construction Company, Milwaukee, Wis., has been incorporated with a capital stock of $10,000 by E. J. Patterson, H. F. Pazik and Julius Jacobsen.

The plant of the United Refrigerator & Ice Machine Company, Kenosha, Wis., is now being operated under the immediate direction of J. D. Rowland and D. E. Callender, receivers, under orders from the Federal Court at Milwaukee. An involuntary petition was filed two weeks ago. It is believed that an early re-organization can be effected. Business on hand and new orders coming in, make it necessary to operate the plant practically at full capacity.

The Milwaukee Steel Foundry Company, South Water and Virginia streets, Milwaukee, Wis., is building a cleaning and grinding department, 60 x 138 ft., but does not require any new equipment.

The Waukesha Spring Water Ice Company has been organized by Chicago interests to establish a plant for the manufacture of artificial ice at the Acme mineral spring in Waukesha, Wis.

Cincinnati

CINCINNATI, OHIO, November 2, 1914.

Machine-tool builders report an increasing number of inquiries. It is doubtless true that more foreign and domestic business is under negotiation now than at any time this year. Actual orders have proved to be rather slow in materializing the past week; but business previously booked from European customers is sufficient to keep several local plants operating to full capacity. In three instances, night forces are employed. The demand for planers and shapers continues light, although the automobile manufacturers have lately purchased a few machines.

Auto truck manufacturers in this vicinity are very busy, but are slow in adding to their equipment, preferring to operate night forces in an endeavor to fill orders in contract time. It is understood that the bulk of the business lately received is from Europe.

While boiler and tank manufacturers report a let up in orders, the total for the 10 months past will about equal last year's record. Wood-working machinery is slow. Second-hand machinery dealers also make indifferent reports; but are more optimistic as to the future.

C. C. Hobbs, Madisonville, Ohio, a Cincinnati suburb, has acquired a site on Indian Hill avenue on which he will erect a planing mill, for which equipment will be required.

The E. Kahn's Sons Company, Cincinnati, meat packer, has had plans prepared for an addition to its plant on Poplar street that will cost approximately $60,000. A 40-ton refrigerating plant has already been purchased from the Triumph Ice Machine Company, Oakley, Ohio.

Covington, Ky., will issue $200,000 of bonds for building a pumping station.

The Bonham Recorder Company, Hamilton, Ohio, recently incorporated, is purchasing equipment for the manufacture of a patented car register.

It is reported that the William Lipphardt Company, Martin's Ferry, Ohio, manufacturer of enameled ware, will establish a branch plant at Middletown, Ohio.

The Delco Company, Dayton, Ohio, manufacturer of automobile specialties, has leased a building on Third street, which will be fitted up for manufacturing purposes.

Birmingham

BIRMINGHAM, ALA., November 2, 1914.

With an increase in the movement of cotton, although at low prices, and with money realized on loans made by warrant warehouses to the extent of $25 per bale, a slightly better tone exists in trade circles. Machinery lines report a share of this sentiment with an increase in inquiries, but there continues to be a dearth of large business. Machine tools for structural purposes are in fair demand and small engines, boilers and pumps are moving out into agricultural sections.

The Anniston Marble & Vault Company, Anniston, Ga., has been organized by W. E. Box, W. E. Smith, and others, with a capital stock of $10,000.

The Piedmont Gin & Seed Company, Piedmont, Ala., has been incorporated with a capital stock of $12,000 by J. R. Barlow and others.

W. F. Tebbetts, Mobile, Ala., is contemplating building a plant to manufacture floor and roofing tile.

Rockmart, Ga., plans installing a 200-hp. 4-valve engine, a 125-kw. generator, etc.

The Columbus Power Company, La Grange, Ga., plans a power plant with a capacity of 600 kw.

F. A. Silver, Greensboro, N. C., is in the market for a 40 to 60-hp. boiler and a 35-hp. first-class second-hand engine.

The Florida Fertilizer Oil Company, Citizens' Bank Building, Tampa, Fla., of which M. A. Munger is president, will receive bids until November 15 for furnishing and installing three boilers, stationary engines and pumps.

Texas

AUSTIN, TEXAS, October 30, 1914.

The machinery and tool trade situation is about the same as a week ago. There are some indications of a revival of business. Cotton is moving more freely although prices are below the profit margin to the grower.

The Chicago Bridge & Iron Company has been awarded the contract by the city commission of Electra for the erection of a 65,000-gal. standpipe for the municipal water works system, the price being $4000. Bids will be received shortly for the construction of a reservoir and laterals and the laying of pipe to the source of supply.

Emil Buescher, Smithville, owner of the electric light and waterworks plant, will install a new Corliss engine shortly.

The Houston Stave Company, Austin, has been organized to manufacture staves. Charles Pearson is among the owners.

The Freeport Light, Water & Ice Company, Freeport, has been organized with a capital stock of $5000 to construct a water, electric light and ice plant. C. A. Jones is one of the principals.

W. R. Ridson, Alamogordo, N. M., and associates, will construct an electric power plant to operate private irrigation pumping plants.

The Northern Texas Utilities Company, Commerce, will make improvements to its electric light and power plant.

The Central South

LOUISVILLE, KY., November 2, 1914.

A slight improvement in business in this territory has been noted, though there is apprehension that the prolongation of the European war will have a depressing effect. The attitude of Great Britain in permitting the free movement of cotton, however, is regarded as promising. Electrical equipment is in better demand. Boilers are not moving well, except for heating purposes. Wood-working machinery is still slow. Ice machinery is unusually dull.

The Kentucky Cotton Yarn Company, Louisville, will equip a plant. It is capitalized at $50,000. W. C. Nones is president and I. F. Phillips manager. Motor drive will be used.

The Schoppenhorst Dry Cleaning & Dyeing Company, Louisville, is planning the erection of a boiler-room and will be in the market for a new boiler, engine, dynamo and other power machinery. F. W. Schoppenhorst is president.

The Kentucky Carbonic Company, Louisville, has been incorporated with $50,000 capital stock and plans to establish a plant next year for the manufacture of carbonic acid gas. C. W. Springer, Jr., and Herman Kraft are stockholders.

The New York Laundry, 628 West Jefferson street, Louisville, will install a boiler and other equipment to cost $10,000.

The W. P. Brown & Sons Lumber Company, Sixth and A streets, Louisville, will equip a dry-kiln and planing-mill at Fayette, Ala., next year.

The Anglo-American Tar Products Company, organized in Louisville, has been succeeded by the American Tar Products Company, 208 South LaSalle street, Chicago, Ill., which is to build a plant at Birmingham, Ala., and other cities. A. T. Hert, president of the American Creosoting Company, Louisville, is chairman of the board of directors.

The Franklin Electric Light & Ice Company, Franklin, Ky., will purchase a 100-hp. boiler.

L. S. Collyer, James Building, Chattanooga, Tenn., is in the market for a belt-driven 12 x 12-in. air compressor.

The Memphis Armature Works, Memphis, Tenn., desires prices on a second-hand 14 or 16-in. lathe.

John T. Walker, Box 55, Rogersville, Tenn., desires prices on a 25-hp. engine and boiler, cut-off saw, jointer, sticker, resaw, matcher, bandsaw, tenoning machine, trim saw, shaper, sander, 2-in. line shaft and bearings.

St. Louis

ST. LOUIS, MO., November 2, 1914.

The machine-tool market is brighter, due apparently to the early opening of the reserve bank at this point, the prospective utilization of the cotton loan fund and because cotton is beginning to move even at present prices. Tentative inquiries continue to appear and some slight increase in actual transactions has set in. Continued optimism is encountered among the dealers and the betterment of the situation is shown in the improvement in collections. Second-hand machinery is in much the same state as new in both movement and tone.

The McElroy-Sloan Shoe Company, St. Louis, will increase the power plant in its branch factory at Louisiana, Mo., and will install a 150-hp. boiler, a 150-hp. generator and a 150-hp. engine.

The Burnall Company, St. Louis, has been incorporated with a capital stock of $125,000 by K. L. Ryan, E. L. Wenhauss and E. M. Rossfeld for the manufacture of fuel-saving devices.

C. J. and F. E. Briner, St. Louis, will erect a factory to cost about $25,000, for the manufacture of electrical machinery and fixtures.

The American Tar Products Company, St. Louis, has been incorporated by J. C. Cannon, F. P. Tralles, E. C. Wolf, Charles Ruane, A. M. McAuliffe and E. M. Smith, and has acquired a site for a branch plant.

The Pickel Marble & Granite Company, St. Louis, has been incorporated with a capital stock of $125,000 by William Pickel, W. Pickel, Jr., H. A. Feldman, and others, to acquire a business operated under the same title and also to increase its equipment and capacity.

The Star Foundry Company, St. Louis, has changed its name to the Thomas Furnace Company and will purchase new equipment for furnace manufacture.

The Miller Engineering Company, Little Rock, Ark., is in charge of drainage work for 315,000 acres and will require pumping equipment.

The Ingall Stone Company, Cassville, Mo., will install a power plant, including boilers, engines, etc., of about 350 hp.

The Sand Springs Machine Company, Sand Springs, Okla., recently incorporated with a capital stock of $75,000 by R. M. Hailweg, G. B. Swope, D. G. Elliott and F. J. Rosgen, will equip at once for the manufacture of engines, pump-jacks, auto-jacks, ventilators and oil field equipment and is in the market for lathes, boring mills, power equipment, etc.

The Mississippi Oil & Gas Company, Reform, Miss., of which R. L. Smith is secretary, is in the market for equipment for the manufacture of briquettes from lignite.

The plans for the enlargement of the West Monroe, La., electric and water plants involve the installation of crude oil engines for power. C. A. Reece, Shreveport, La., is the engineer in charge.

The Pacific Coast

SEATTLE, WASH., October 27, 1914.

In industrial circles a growing feeling of confidence is helping to better conditions and arouse interest. An increasing interest in the export trade is felt, and it is announced that eight boats in Portland have been chartered to carry grain and flour to Europe. The millers announce that orders already contracted for are sufficient to keep all mills going for at least three months.

Preparations for next year's crops are proceeding on an unusually large scale, causing a marked revival in the implement trade. Small shops are showing more signs of activity, and a good winter business in tools and equipment is expected. The call for tractors and other heavy agricultural equipment is growing and there is demand for specialties such as stump-pullers. In the lumber regions along the coast business remains dormant. The curtailment of sawmill operations continues. A fair volume of work, however, is under way at shipbuilding and repair plants.

Frank R. Roles, Stanfield, Ore., local representative for the Peerless Air Motor Company, announces that it will establish a windmill factory. Plans are under way.

The Peoples Milling & Elevator Association, Boise, Idaho, has been incorporated with a capital stock of $100,000 by C. E. Meyer, Twin Falls, who is president, and J. W. Hearson, Boise, the secretary. It plans to erect flour mills.

The Cumberland Coal Company, Seattle, has commissioned Reitze, Storey & Duffy, engineers, Northern Bank Building, Seattle, to prepare plans for a coaling plant to be built at Occidental and First avenues, at a cost of about $18,000.

A. Snyder, Lewis, Wash., announces that he is in the market for electric motors, etc.

The Boise Artesian Hot & Cold Water Company, Boise, Idaho, will require additional electrical equipment for its plant.

The Golden West Motors Company, Ochsner Building, Sacramento, Cal., has erected and equipped a factory 150 x 300 ft., and a pattern shop for the manufacture of auto trucks. It will begin the construction of a third building, and is figuring on buying quite a lot of automatic high-speed machinery shortly. Mark L. Burns is in charge.

Eastern Canada

TORONTO, ONT., October 31, 1914.

The general brightening of business conditions is having a telling effect in the industrial centers of Canada. From Sydney, N. S., where the chief plant of the Dominion Iron & Steel Company is situated, comes the report that present conditions and outlook are vastly better than the most buoyant optimists ventured to predict six weeks ago. Large orders have come in for soft steel products. The rod mill has not been so busy for a year. This week the nail mill went on a double-shift. Steel bars and blooms are being produced on a large scale. Nine of ten open-hearth furnaces are in operation.

It is announced that the National Steel Car Company, Hamilton, Ont., has received a large part of a $500,000 order for equipment for the Intercolonial Railway.

Plans have been prepared and bids will shortly be received for the construction of a machinery hall at the exhibition grounds, Toronto, for the Canadian National Exhibition Association, to cost $145,000. It will be of concrete, steel and brick construction. G. W. Gouinlock, Temple Building, Toronto, is the architect.

Garage equipment and machinery for the manufacture of carbureters will be installed by Williams & Co., 58 Parks street, Niagara Falls, Ont. Electric power will be used.

The City Council, Ottawa, Ont., will call for tenders for one 15,000,000-gal. electrically-driven pump.

Plans are being prepared for the erection of a furniture factory at Goderich, Ont., for J. E. Baechler, North street, to cost $50,000. Jades Fowler, Box 171, Goderich, is the architect.

An appropriation of $45,000 to be used for the purchase of engines, generators and other machinery for the new technical school was passed by the advisory industrial committee, Toronto, and a request will be made to the board of control for the funds.

Fire originating in the boiler room did $15,000 damage to the plant of the Sutherland-Innes Stave Mills Company, Chatham, Ont.

The Standard Radiating Company, Ltd., Toronto, has been incorporated with a capital stock of $80,000 by J. W. Brown, Francis Kennedy, and others, to manufacture heating apparatus.

The Anglo-Canadian Motor Sales Company, Ltd., Toronto, has been incorporated with a capital stock of $50,000 by A. G. Browning, 6 Adelaide street, east; G. E. Buchanan, and others, to manufacture automobiles.

The Essex Motorcycle & Machine Company, Ltd., Essex, Ont., has been incorporated with a capital stock of $100,000 by J. R. Gay, J. W. Brien, J. A. Hill, and others.

The Blashill Wire Machinery Company, Ltd., Montreal, has been incorporated with a capital stock of $48,000 by J. A. DeCew, Montreal; H. A. Radford, Westmount, Que.; R. E. Johnston, St. Lambert, Que., and others.

Western Canada

WINNIPEG, MAN., October 30, 1914.

The demand for machinery is comparatively quiet. Very few new industries are starting up. It is not very likely that there will be much improvement this year. Trade in machinery parts for additions and repairs to established industries is fair.

The Grand Trunk Pacific Railway Company, Montreal, Que., has let contracts to Carter, Hall & Allinger, Winnipeg, Man., to the value of $300,000 for terminals at four divisional points in British Columbia, namely: Prince George, Endako, Smithers and Pacific. The work will include roundhouses, machine, shops, etc.

Du Cane, Dutcher & Co., Rogers Building, Vancouver, B. C., have been appointed consulting engineers for the White Valley Irrigation System and are preparing plans for a pumping plant to cost about $500,000.

The International Linseed Company, Cincinnati, Ohio, plans to build a plant at Moose Jaw, Sask., for the manufacture of linseed oil, etc., and to erect elevators with a capacity of 250,000 bu.

The plant of the Alberta Linseed Milling Company, Medicine Hat, Alberta, burned recently, will be replaced.

Government Purchases

WASHINGTON, D. C., November 2, 1914.

Bids were received by the Bureau of Supplies and Accounts, Navy Department, Washington, October 27, for supplies for the navy yards, as follows:

Schedule 7360, Steam Engineering, Class 41, Philadelphia—Three marine water-tube boilers, with spare parts—Bid 18, $85,782; 221, $77,194.82 and $78,194.82.

Schedule 7361, Steam Engineering, Class 42, Philadelphia—Air and oil pumps, etc.—Bid 24, $29,105 and $34,775; 53, $32,496.90; 239, $26,504.

Schedule 7369, Steam Engineering, Class 84, Puget Sound—One electric hoist—Postponed until November 10.

Alternate—Same, f.o.b. mill—Postponed until November 10.

Schedule 7371, Steam Engineering, Class 92, Puget Sound—One water-tube boiler—Bid 81, $3574; 153, $4100; 18, $4555.

Alternate—Same, f.o.b works—Bid 78, $2400; 81, $2640; 153, $3800; 190, $2300; 221, $3750; 18, $3980.

Schedule 7406, Steam Engineering, Class 201, Norfolk—Eight vertical pumps, with 13 spare parts—Bid 24, $1168; 53, $724.70.

The names of the bidders and the numbers under which they are designated in the above list are as follows:

18, Babcock & Wilcox Company; 24, Blake & Knowles Steam Pump Works; 53, M. T. Davidson; 78, Gas Engine & Power Company and Charles L. Seabury Company; 81, Heine Safety Boiler Company; 153, Puget Sound Boiler Works; 190, Talbot Boiler Works; 221, Charles Ward Engineering Works; 239, Warren Steam Pump Company.